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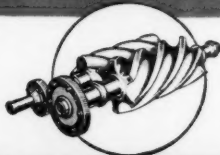
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The Mining Journal

London, June 5, 1959

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Titanium Becomes Cheaper

AT a time when the titanium metal industry in the United Kingdom is still operating far below production capacity, Imperial Chemical Industries has announced the biggest cuts yet made in the prices of British wrought titanium products. Sheet, strip, plate and wire have been cut by 25 per cent, rod and billet prices by 15 per cent, and extrusions by 12½ per cent. These are the second reductions to be announced by I.C.I. during the past twelve months, for on July 1, 1958, the company cut its prices of wrought titanium and alloy products by amounts ranging from 5-20 per cent, the cost of a typical titanium rod then falling from 95s. to 75s. per pound.

So far titanium's main outlet—indeed, until quite recently its only substantial market—has been in aircraft production. Both here and in the United States the industry's difficulties originated from a reduction in governmental demand for military aircraft. However, titanium's high strength/weight ratio is also attractive to builders of large commercial aircraft, who calculate that each pound of weight saved is worth \$250-\$300 in additional payload in the life of the plane. Hence titanium metal is being used in increasing quantities, both in airframes and in engines. The new Douglas DC8 jet contains 2,000 lb. of titanium, the Convair about 2,500 lb., and the Lockheed Electra 700 lb. The new Comets also contain a considerable number of titanium parts.

Because of its outstanding resistance to corrosion, titanium is in growing demand for chemical processing equipment, as well as for such diverse applications as bleaching and paper pulp manufacturing equipment, overhead installations in railway electrification, and in the extensive field of cathodic protection. Mineral dressing and metal refining are both fields in which opportunities for using titanium equipment with advantage can be foreseen. Indeed, one of the largest non-military orders which have been placed for titanium involved seven miles of tubing for Freeport Sulphur to be used in processing equipment for treating nickel-cobalt concentrates.

On both sides of the Atlantic, the active campaign to establish titanium in the construction of chemical plant is beginning to show results. The development of this metal has made possible a number of chemical processes which previously could not be carried out on a production scale owing to the lack of a suitable material of construction. Recently the opportunities for exploiting titanium's corrosion resistance have been further extended by I.C.I.'s discovery of a simple but effective electromechanical process, whereby resistance to sulphuric and hydrochloric acids and other reducing media has been greatly improved. Moreover, progress in titanium lining has been rapid. Last year I.C.I. reported that the technique had advanced to a stage when an ammonium chloride drier measuring some 40 ft. long by 5 ft. dia. would shortly be lined on site.

The very large sums, which titanium producers both in the United Kingdom and in the United States are expending on techni-

cal research and market development, can be expected to lead to a further substantial broadening of titanium's markets. Already this metal is proving itself to be commercially justified in many applications, outlasting by a wide margin the materials previously used. It can be no easy task, however, to persuade new customers of the economic advantages of an unfamiliar metal which, despite the latest reductions, is still much more costly than conventional materials.

There are, of course, many instances where titanium's properties may permit the re-design of plant or equipment to reduce its size, and in this way it could be produced in titanium metal at a cost which would compare very favourably with that of similar equipment made from conventional materials, even without taking into consideration the saving in maintenance and plant shut-downs.

As with any new engineering material in its earlier years, titanium producers are faced with a demand which is as yet too limited to permit the capacity operation which would lower production costs and so facilitate the price cuts which could lead to increased demand. Last year, Dr. W. H. G. Lake, director of I.C.I. Metals Division, was quoted as stating that, without further technical improvements, the company could drop its prices by 50 per cent if it could get its plants working to something like capacity.

Imperial Chemical Industries' approach to the problem has evidently been to bring down the price in the confidence that by making titanium more competitive in this regard with other metals, sales can be increased. It is noteworthy that, despite being a newcomer to the titanium industry as compared with United States producers, this British company has been able to produce raw titanium metal by the cheapest method so far available and sell it at the world's lowest published selling price. Following the latest reductions, its titanium prices have been reduced by more than half since commercial production was started at Wilton in 1955.

On the other side of the Atlantic, impressive progress has also been made in bringing down titanium prices, which have been halved in the past five years. By the end of 1958 the price of United States sponge had fallen to \$1.82, which compares with \$5 five years ago. The United States titanium metal industry has already made quite a dramatic recovery from the setback arising from the cut-back in military requirements in mid-1957. After falling by mid-1958 to about 10 per cent of capacity, output began rising during the third quarter of the year, and it is understood that a considerable amount of new interest in the properties of titanium metal has been shown in the missile, food processing, paper making, marine, automotive, and other industries.

Although titanium metal is firmly established as a structural metal for aircraft and chemical engineering in applications where its special properties justify the high initial cost, its future prospects are clearly dependent on a number of factors, notably technological progress, market development, and the prices of sponge and mill products. So far as the technological aspects are concerned, it is understood that I.C.I. alone are spending some £500,000 annually on titanium research and development. Recognizing that titanium metal will only achieve its full commercial potential when its price becomes more directly competitive with that of established engineering metals, the company has consistently followed a policy of bringing down prices as rapidly as possible.

Having regard to the brightening economic horizon in the United Kingdom, it may well be that the latest and largest price cuts will prove to have been particularly well timed. Doubtless further reductions will follow as demand increases and plant efficiency is still further improved.

FLIGHT FROM THE N.C.B.—AND THE DOLLAR!

We have over the past two or three years been witnessing two trends in the British mining machinery manufacturing industry, unrelated as to cause but closely connected in effect.

First, there has been for some years the growing likelihood (finally realized last year) that British mining machinery manufacturers would need to diversify their markets in the future to offset an eventual recession from the exceptionally high level of purchasing by the National Coal Board in the first decade of nationalization. Secondly, as inflation has been carrying the hourly wage rate in America to levels where it has been increasingly difficult to sell American-made machinery overseas, so the American manufacturer has tended increasingly to avail himself of British or Continental manufacturing facilities and wage rates. In the case of mining machinery, a number of American firms had previously been led to establish themselves in Britain through the attractions of the N.C.B. market, so that, so far as this industry is concerned, the flight from American wage rates has meant more often an intensification of British operations than an entirely new departure.

These thoughts are prompted by the interesting announcement last week of plans by Joy-Sullivan Ltd. to initiate the manufacture, at their Greenock works, of a range of compressors and compressed air equipment (described on page 622) which formerly had only been available from the parent company's factories in America. The British company has established a new Air Power Division to handle these products, and it is a significant sign of the times that the Joy-Sullivan organization expects in future to rely almost entirely on the Greenock manufactured products of this new division for all markets outside of North America.

This announcement is of some general interest on two counts. First, it seems likely to provide for the Greenock factory the type of product and market diversification which, one way or another, many mining machinery manufacturers in Britain are now seeking. Secondly, Joy-Sullivan Ltd. clearly counts on selling a substantial proportion of the products of its new division overseas. This is an expectation which serves to underline the fact that diversification for the British mining machinery manufacturer must almost inevitably mean diversification into overseas markets.

R.S.T.-BAMANGWATO AGREEMENT

The Rhodesian Selection Trust group of companies and the African Authority for the Bamangwato Tribe have signed an agreement granting rights to carry out prospecting and exploration operations over an area of approximately 40,000 square miles of the Bamangwato Tribal Area in Bechuanaland.

Under the agreement, Rhodesian Selection Trust Exploration Ltd., after an agreed preliminary period of investigation, may form a company to be controlled by it which will have the right to prospect and explore over the area for a period of up to ten years. In the event of mineral discoveries of economic significance, mining rights will be exercisable by such company or by mining companies formed by it. Any mining companies so formed would pay royalties to the Bamangwato Tribal Authority on a basis which has been agreed between the parties.

After the formal signing ceremony, Sir Ronald Prain, who signed for Rhodesian Selection Trust, made it clear that it was not merely a matter of time before mines were opened up in the territory. "While this agreement ensures that a serious attempt will be made to discover minerals in economic quantities", Sir Ronald said, "it does not in itself guarantee that such search will be successful".

An R.S.T. announcement from Salisbury says that Mond Nickel Exploration of Canada and Minerals Separation of London will be associated with R.S.T. in the prospecting operations. R.S.T. Exploration will direct and control the programme on behalf of an exploration company which will be formed for the purpose, and in which R.S.T. will have a controlling interest.

An article on the Bamangwato Area and its mineral resources will appear in next week's *Mining Journal*.

LEGAL OBSTACLES TO MINERAL PROSPECTING

The legal obstacles hampering the search for economic deposits of minerals in Southern Rhodesia were discussed by Mr. F. Elliott in seconding the adoption of the report and accounts at the recent annual meeting of the Chamber of Mines of Rhodesia. In urging the desirability of relieving the mining industry from some of the present restrictions, Mr. Elliott effectively shattered the delusion that payable deposits are easily found.

During the last 11½ years, he stated, 78 Exclusive Prospecting Orders have been granted in Southern Rhodesia. The total area involved is about 4,400 sq. miles and the minimum expenditure laid down by the Mining Affairs Board to be spent in the exploration of these Exclusive Prospecting Orders amounted to over £1,250,000. The actual expenditure has many times exceeded the minimum sum.

The mining companies may be presumed to have applied for Exclusive Prospecting Orders in what, with their present knowledge, they consider to be the most geologically favourable country for the location of economic deposits. Yet, to the best of Mr. Elliott's knowledge and belief, not one single virgin deposit of economic value has been found, the discovery of which can be directly attributed to the taking out of an Exclusive Prospecting Order.

It is, of course, quite on the cards that a number of valuable deposits might be found very shortly in these areas—that is one of the gambles attached to mining exploration. But, on the actual results over the past 11½ years, it is scarcely inconceivable that the mining groups might become discouraged if some successful finds are not made in the fairly near future, and it could be that, at a later date, the government might have to make substantial concessions if Southern Rhodesia is to be still further prospected.

From the facts and figures regarding the absence of virgin discoveries of economic deposits in the 79 Exclusive Prospecting Areas covering 4,400 sq. miles, the farmer seems in reality to have very little real basis for the fears that he might have to vacate his homestead due to the discovery of an economic mineral deposit within the very small area surrounding it (one-quarter of one sq. mile), which is at present protected. At a recent meeting between representatives of the Chamber and the Rhodesia National Farmers' Union, discussion revealed some prospect of reaching agreement in regard to prospecting on reserved ground, thereby removing a major obstacle to

more harmonious working conditions between the miner and the farmer.

In Native Purchase Areas, the existing law, under certain circumstances, can present almost insuperable bars to the investigation of a mineral deposit. In many cases the blocks of ground sold to Africans are about 200 acres in extent, and a ruling by the Mines Department states that the living quarters of an African owner has the same legal standing as a European homestead. Consequently, out of a holding of say 201 acres, it is possible that 160 acres could be debarred to prospecting. Where large areas have been allocated in plots to many African owners, the exploitation of what might be a very valuable deposit could become impossible.

Yet suitable access might enable many millions of pounds worth of minerals to be produced from a small area over a comparatively short period of time, instead of a few hundred pounds worth of crops per annum, as would be the case in Native areas. The life of a mine is short and when the mine closes down, all but a very small area can revert to agriculture. Moreover, the establishment of sizeable mining operations in Native areas could be the means of opening up remote parts of the country, thus providing ready markets for agricultural products, where none exists at present, and the direct employment of local Africans.

As Mr. Elliott points out, a plan showing the location of European Areas, Native Reserves, Native Purchase Areas and Special Native Reserves looks like a jig-saw puzzle. One can be quite sure that when Nature caused the deposition of mineralized bodies, no account was taken of the artificial sub-divisions of land now existing in Southern Rhodesia!

It would appear that if the Government of Southern Rhodesia is anxious to encourage the full exploitation of all mineral deposits, a determined and concerted effort by all the departments concerned to eliminate the existing difficulties will be required.

NATIONAL COAL BOARD ACCOUNTS

The thirteenth annual report of the British National Coal Board published recently contains a wealth of statistical information covering the operation of United Kingdom collieries in 1958. Faced with mounting stocks and rising production costs, it is not surprising that the loss for the year amounted to approximately £13,500,000.

Although in January the government, as part of an anti-inflation programme, reduced the capital allocation to the Board to £100,000,000, it was found impracticable to reduce capital expenditure below £104,000,000—slightly more than in the previous year. This brought the total capital expenditure by the National Coal Board since 1947 up to £765,000,000.

During 1958 recruitment to the mines was greatly curtailed, and manpower by the end of the year was nearly 23,000 less than at the beginning, being down to a total of 687,400. Productivity during the year, at an average of 791 man-shifts per 1,000 tons, was the highest ever recorded despite a marked slowing down in the rate of face mechanization. The total cost per ton of saleable coal is given in the report as 83s. 11d., which represents a rise of 2s. 11d. per ton over 1957. Proceeds per ton of saleable coal were 85s., but payment of interest to the Ministry of Power on money borrowed resulted in an overall loss on the year's operations.

ALUMINIUM IN MINING—I.

Aluminium Goes Underground

THE primary reason for the increasing use of aluminium equipment in the mining industry is that aluminium and aluminium alloys offer a desirable strength/weight ratio at reasonable cost. Other advantages in aluminium are its ability to resist most forms of corrosion; the danger of sparking is minimized; it is non-magnetic; it is relatively easy to form into complex shapes; is easy to join by bolting, riveting, brazing, or welding; it has high elasticity allowing it to stand up to rough treatment and shock loading; it is a good conductor of electricity; it is non-toxic; and it has the characteristic of increasing its mechanical properties at very low temperatures.

The bulk of the aluminium used in Canada's mines performs some transportation function. In the majority of cases aluminium is used primarily as a weight reducer, although corrosion resistance can also offer significant reductions in maintenance and replacement costs.

Other equipment used in the actual mining operation includes pumps, hand tools and drill parts, roof supports, rock bolts and concrete forms. Many of these are either wholly or partly made of aluminium.

Aluminium cages and skips have become standard equipment in many mines. Most have been fabricated from a magnesium silicon alloy of aluminium (Alcan 65S), the plates and sections usually being riveted and bolted together with steel rivets and bolts. The current recommended practice is to employ a magnesium alloy (B54S plate with A56S or 65S extrusions) and fabricate by welding with the inert metal arc welding process. This gives

One of the notable developments in mining during recent years has been the increasing introduction of aluminium equipment in both underground and surface operations. The following article, the first of two, describes the use of aluminium in the construction of underground equipment in Canadian mines; the subsequent article being confined to surface applications. The article in its entirety is condensed from a survey in Precambrian by B. H. J. Edmond, development engineer, mining industry, Aluminum Co. of Canada Ltd.

a stronger, less expensive structure, with better resistance to corrosion and further savings in weight. There are instances where high strength (24ST3 alloy) skip and chute liners are being used due to the good abrasion properties of the metal.

The total weight of cages and skips in steel are normally at least halved when fabricated in aluminium. To quote one example, on a three-skip cage combination made by Dorr-Oliver-Long, 4,450 lb. of aluminium were used, saving 6,500 lb. in weight for each cage.

Recently, new designs of welded skips and cages have been made which can enable the weight in aluminium to be decreased to nearly one-quarter the usual steel weight. An Ardel Industries skip and cage made by Carter Bros. is of welded construction, and is one-third the weight of the unit it replaced.

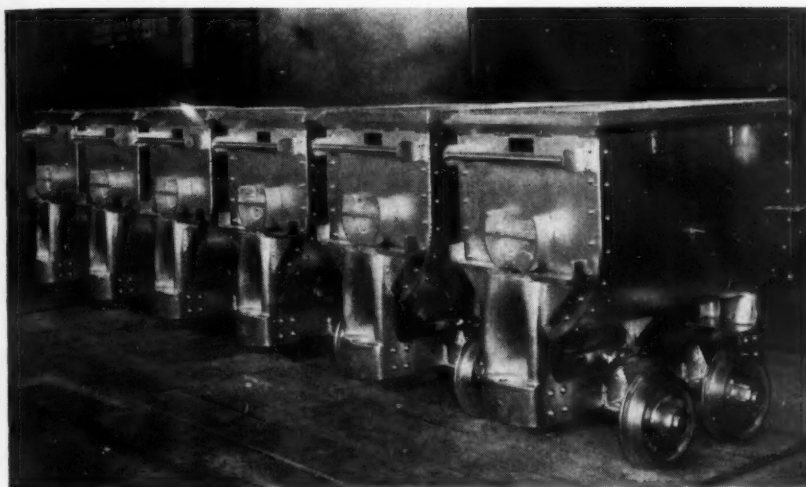
A significant improvement in mine transport has resulted from the introduction of aluminium alloy mine cars, tubs, and trucks. Tubs for transporting coal have been reduced from 1,460 lb. to 825 lb., giving a reduction of approximately 43 per cent in tare weight.

A good many smaller conveyors are made of aluminium when they are required to be portable. In larger and more permanent handling systems, which include loaders, excavators, and aerial ropeways, weight reduction of moving parts increases haulage capacity and reduces inertia.



Alongside (at left), 2,000 lb. aluminium mining skip and cage built by Montgomery Explorations by Ardel Industries Ltd. Below: a Canadian Ingersoll-Rand JR-38 Jack-drill at Suffield Mine, Sherbrooke, which utilizes an aluminium alloy lightweight air leg





Much of the pipe used in the mining industry is standard steel pipe with a schedule 40 wall, although light wall steel pipe is also being put into service.

However, in recent years there has been an increasing amount of aluminium pipe used. The Aluminum Company of Canada reports many Canadian mines are now using Alcan industrial pipe in sizes ranging from 1 in. to 8 in. with schedule 5 or schedule 10 walls. The pipe is one-sixth and one-third the weight of standard and light wall steel pipe respectively.

The alloy used in Alcan industrial pipe has a typical yield strength of 43,000 p.s.i. The pipe is extruded as a seamless product in 20 ft. or 40 ft. lengths with each length tested to 1,000 p.s.i.

In pulleys, sheaves, and idler rollers, a great reduction in weight and inertia is gained by using aluminium.

In so far as mining tools are concerned, whether operated manually, by compressed air, or by electric motors, the tools employed in the mining industry generally require physical effort to operate, especially in confined spaces.

Rock drills have many of their components in aluminium, including casings, guide shells, drill legs, and air cylinders. High strength aluminium alloy drill rods (24S and 75S alloys) have been used on a number of occasions, especially where the lightweight non-magnetic properties of aluminium are required.

Standard forms of anchor props and cutter derricks are made from extruded and forged aluminium sections with considerable saving in weight without loss in strength. One type of anchor prop design consists of an extruded "I" section in 24S alloy with the same alloy for the shoe and shackle, fabricated from plate and extruded bar. A cutter derrick of more advanced design gives considerable adjustment in length. This is fabricated using two aluminium tubes, one of which slides into the other. A machined aluminium shoe at one end provided a bearing surface with provision for attaching the cutter rope; the total weight was 46 lb.

The advantage of using aluminium prop pullers has been fully proved by the many thousands in service in Europe. It is equivalent to the steel puller in strength and is only one-third the weight. Beam stackers have been made in which the vertical member is in 24S alloy, which is also used for some of the other components. This stacker, used for beams up to 15 ft. in length, only weighs 99 lb., of which 44 lb. is aluminium.

Above, one ton aluminium rocker dump cars built by Dorr-Oliver-Long for Newfoundland Fluorspar Ltd. Alongside, aluminium rock bolts



Prop twistlers have been made completely in aluminium except for the steel swivel bolt, again reducing the weight to one-third.

Aluminium shovels are available which raise the efficiency of hand shovelling by reducing fatigue, since there is a weight reduction of approximately 3 lb. They are also used in the asbestos mines as a replacement for wood shovels, since it was found that contamination of the asbestos fibres resulted from the latter.

Other applications of aluminium for mining tools include bar straighteners, rail benders, cutter parts, belt cutting and fastening tools, tubular handles for picks and other hand tools, re-railers, first-aid stretchers, locker bars and detonator carrying cases. Aluminium scaling bars have proved desirable where men are working overhead.

Due to the almost unlimited variety of shapes produced by the extrusion process, it is possible to design aluminium sections with a modulus to give the maximum resistance to the stresses applied and thus make full use of the amount of metal used in the section. The twin webbed hollow roof beam illustrates this point. The section is capable of replacing a 5 in. x 4½ in. rolled steel joist weighing two and a quarter times as much.

Roof bars or roof straps are also produced in the same alloy as the roof beams. As an example, two Benk bars, both 5 in. wide, are 1½ in. deep and ¾ in. deep, and weigh 4.9 lb. and 3.7 lb. per foot respectively. Another method for roof support is aluminium rock bolts.

Aluminium concrete forms have been used in mining operations to provide support while concreting the walls and roofs of underground workings. They have been employed with considerable success in the Eastern Townships in the asbestos mines, and offer a great saving in weight compared with steel.

A typical arrangement consists of 18 ft. sets of sectional forms built up of aluminium frames bolted and clamped together with aluminium segments in order to provide a complete lining with sufficient space to pump in concrete between the aluminium surface and the rock face. One complete set of these forms weighed 18,000 lb.

Underground Hydraulic Coal Mining

SUPPLY of water to each working face, in sufficient quantity and at a suitable pressure, is an essential requirement for hydraulic coal mining. The quantity of water is determined by fluming conditions, i.e. required rate of coal production and flume gradient. The water pressure depends upon the required power and throw of the water jet. High pressures are necessary if the water jets are used to break the coal, but if it is broken by explosives the pressure need only be sufficient to throw the water jet to reach the heap of coal. In the U.S.S.R., water jets break the coal, and water pressures up to 600 p.s.i. are used, and there are reports of experiments with pressures of 3,000 p.s.i. and research into pulsed jets with pressures of 18,000 p.s.i. (water pressures of 2,000 p.s.i. are used in mining gilsonite in the United States).

In New Zealand, coal is broken with explosives, and water pressures do not usually exceed about 50 p.s.i. This pressure will disintegrate soft bands in a seam and crushed coal in pillar stumps, but it will not break hard virgin coal. Methods of obtaining the water supply depend upon the quantity and pressure required, local rainfall, and the size and nature of the catchment area in the vicinity of the mine.

Flume Transport

Transport of coal in flumes by the carrying action of water is an essential feature of hydraulic coal mining. Fine coal is carried in suspension, medium sizes in a series of leaps or jumps, and large coal by sliding or rolling. Actual sizes carried by each method depend upon the velocity of the flow, amount of turbulence, and specific gravity of the coal. Broken coal is washed from the coal face along the seam floor into the flume.

Flow characteristics of coal and water in flumes have never been fully investigated; practical considerations include water quantity, flume gradient, and friction, which depends upon the materials of construction. Flumes are constructed of 1 in. wooden planks or of semi-circular steel plate. Wooden flumes are lined along the bottom to minimize wear. Wooden flumes are either square or trapezoidal in cross-section; their size in New Zealand varies from 10 in. x 10 in. to 24 in. x 24 in., depending upon the required capacity and maximum size of coal to be transported.

Velocity-breaks, made of large wooden boxes set into the flume, are used when it is necessary to reduce the velocity of flow, and these are often placed at the bottom of a steep length of flume. Holding pens are built into the flume to provide storage for coal; they are constructed by placing a barricade across a length of level underground roadway or in a suitable position on the surface.

Flumes should preferably be built in a straight line, but changes in direction can be made, if not too severe, by increasing the height of the side boards of the flume on the outside of the curve and by slightly increasing the gradient. There are two methods of fluming: (1) coal is flumed in a continuous flow from the coal face to the bins; or (2) coal is flumed to a holding pen and retained there before being discharged to the next length of flume.

Flume transport under suitable conditions has many advantages from the aspect of safety and economics. Coal is completely wetted during transport from the coal face to the bins, and there are none of the hazards associated with

Aspects of underground coal mining using hydraulic methods in New Zealand and the Soviet Union have been discussed by Mr. W. B. Watson, Senior Lecturer in Mining, University of Otago, in "Chemical Engineering and Mining Review", Vol. 50, No. 9, Melbourne, Australia. The following article condenses the author's remarks.

coal dust. The main limitation to flume transport is the necessity for a continuous gradient in favour of the load; a disadvantage is that it is a one-way trackless transport system, and alternative transport must be provided for supplies and if necessary for men.

Underground Mining in New Zealand

Hydraulic coal mining is applicable only to inclined seams, and the practical minimum gradient is probably about 1 in 60, although the method is more successful with steeper gradients. Hydraulic methods are used mainly in small areas of coal and in areas of abandoned coal where pillars have not been extracted or only partially extracted.

The method of mining is bord and pillar, and the seam is developed by driving main entries from the lowest point on the outcrop or underground workings to form pillars in panels. When extracting pillars in thick seams by hydraulic methods, almost complete extraction is obtained; this is a big improvement on conventional methods. Many seams in New Zealand are liable to spontaneous combustion, and the higher percentage extraction is an advantage. The flow of water along mine floors or flumes induces a flow of air in the same direction, and where possible this is arranged to assist the ventilation.

Underground Mining in the U.S.S.R.

Where possible, coal headings are driven on a rising gradient of 1 in 20 to allow flume transport of coal and water. A hydraulic monitor is set up about 6 ft. from the coal face and the water jet directed at the weakest part to make a cut 2 or 3 ft. deep, either at floor level or parallel to the stratification. Seams of low gradient are developed in panels; headings within panels are driven to the full rise, to form pillars 50 ft. wide and 500 ft. long.

Vertical and steeply inclined seams are mined in panels formed by levels and raises driven in the seam. Level interval is 150 ft. and raise interval along levels is 200 ft. to 400 ft. Panels are developed by driving sub-levels to form blocks of coal 20 ft. thick between the sub-levels.

Results

Although hydraulic coal mining is still in the development stage in the U.S.S.R., the results already show an improvement on conventional methods of mining. Overall output per man-shift is three to five times that of the best mines in the same district using other methods, and it is claimed that eventually it will be ten times; the increase

will be greater in thick, steep seams than in flat-lying thinner seams. It is also reported that the capital cost of a mine to be worked by conventional methods is two and a half to three times that for hydraulic mines, but there is no information about the cost of the capital in terms of amortization period and plant depreciation rate.

In New Zealand, underground hydraulic coal mining has produced coal at less cost than any other underground

method; in some cases from areas of coal abandoned because of fire, which could not be mined by any other means. Depreciation charges are lower than for other methods, supporting the U.S.S.R. claim of lower capital cost for hydraulic mines.

Hydraulic coal mining is an interesting method of mining and although it cannot be universally applied, it is worthy of investigation by any coal mining country.

The Commonwealth's Thorium Resources

BOTH uranium and thorium are oxyphile elements. They do not occur in the native state like gold or silver, but form minerals of varying degrees of chemical complexity, all containing oxygen. Oxides, phosphates, and niobates, for example, are fairly common, but sulphides, arsenides, and tellurides are not known. Geochemically, uranium and thorium are associated with the more acid rocks of the lithosphere, the average content of granites being respectively 3.5 and 13.0 p.p.m., as compared with 0.8 and 3.1 p.p.m. in the case of basic igneous rocks.

The grade of raw material that can be worked commercially depends on a number of factors. As a general guide, however, vein deposits require to average 0.2 per cent U_3O_8 , and large disseminated deposits 0.1 per cent U_3O_8 . As a by-product, uranium is currently being recovered from ore containing as little as 0.01 per cent U_3O_8 . Similar values apply for thorium provided a concentrate containing 5 to 6 per cent ThO_2 can be produced at low cost.

Current estimates of reserves of thorium in non-Communist countries are given in the table. Reserves indicate that the Commonwealth controls more than three-quarters of the resources of both metals.

No reliable data are available on the production of thorium, but a total of 700 tons ThO_2 is believed to have been produced by non-Communist countries in 1958.

RESERVES OF THORIUM

Country	Reserves tons ThO_2
India	300,000
Canada	210,000
Brazil	200,000
Australia	50,000
U.S.A.	50,000
South Africa	15,000
West Africa	15,000
Nyasaland	10,000

Thorium is at present mainly used in the production of magnesium-thorium alloys and in the manufacture of thorium nitrate for gas mantles. Some is being used in experimental reactors, but as yet there is no great demand for thorium as a fuel element.

Distribution

Canada: Both the disseminated deposits in the Blind River area and the pegmatitic granite dykes of Bancroft contain appreciable thorium. Reserves are estimated to total some 200,000 tons ThO_2 at an average grade of 0.05 per cent. Assuming a production of uranium oxide of 10,000 tons a year, about 5,000 tons of ThO_2 might be recoverable as a by-product. Thus Canada, in addition to being one of the major uranium producing countries of the world, is likely to become a major producer of thorium.

From a paper by S. H. U. Bowie, B.Sc., M.I.M.M., entitled, "The Uranium and Thorium Resources of the Commonwealth", delivered to the Royal Society of Arts on April 23, 1959. This extract is confined essentially to the sections relating to thorium.

Union of South Africa: Thorium does not occur in appreciable amounts in the Witwatersrand Basin, though there are local concentrations in the Dominion Reef, for example, to the west of Klerksdorp, where monazite forms up to 8 per cent of the heavy minerals.

The thorium deposit discovered at Steenkampskraal in the Western Cape Province in 1949 is of particular interest, as it was the first thorium vein deposit to prove of economic value. The ore is a high-grade monazite which replaces hydrothermally altered granite gneiss along a well-marked shear zone. The monazite is accompanied by apatite and zircon, as well as coarser copper and iron minerals of a later phase of mineralization. More than 16,000 tons of pure monazite had been produced from this deposit by the end of 1956; and recent estimates indicate ore reserves of some 250,000 tons at a grade between 3 and 6 per cent ThO_2 .

Carbonatites in South Africa are sometimes appreciably radioactive, and it is possible that the uranothorianite which occurs at Palabora might be recovered as a by-product from the recovery of copper.

Australia: Australia has reserves of thorium in the large deposits of heavy-mineral sand that occur on the beaches and dunes of south-eastern Queensland and north-eastern New South Wales. These sands are particularly rich in zircon and rutile, which are the main commercial minerals. The thorium-bearing mineral, monazite, averages about 0.3 per cent of the total heavy-mineral fraction, and is recovered as a by-product. Production in 1957 amounted to 132 tons of high-grade monazite concentrate. The thorium content of the monazite ranges from 6.3 to 7.4 per cent, averaging about 6.6 per cent.

India: Important new discoveries of very large placer deposits containing monazite have also been made recently over an extensive inland area of Bihar and West Bengal. The mineralized region covers a series of peneplanes on the north-eastern flank of the Indian shield, and although the average content of heavy minerals is only 2 to 4 per cent, roughly a quarter of the total heavies is monazite. In an initial test area covering 130 square miles, it is estimated that 34,800 tons of monazite occur per square mile over an average thickness of just less than 3 ft. Associated heavy minerals, roughly in order of abundance, are ilmenite, sillimanite, zircon, magnetite, rutile, columbite-tantalite, and apatite.

The monazite deposits associated with ilmenite along the south-west coast of India, including the commercial deposits of Chavara and Manavalakurichi, in Kerala and Madras States, are known to most geologists. The monazite in these deposits has a fairly high ThO_2 content, usually between 7.5 and 9.5 per cent, while the U_3O_8 content is about 0.3 to 0.4 per cent. Shallow boreholes put down through the beach indicate that the heavy minerals persist to a depth of 24 ft., though the concentration decreases somewhat in depth. Sixteen occurrences covering an area of 3,000 acres have been sampled, and the quantity of monazite available to an average depth of about 20 ft. is estimated to be 1,400,000 tons. Considerable quantities of monazite also occur in lake deposits and sand dunes, as well as heavy sands up to a mile off-shore, but the reserves in these have not yet been assessed.

Nyasaland: Important reserves of monazite occur in Nyasaland along the west shore of Lake Nyasa, particularly in the Monkey Bay region. At least three deposits here are large enough to be of commercial value. The monazite occurs in fine-grained consolidated sand in raised beaches near the present shore-line, and has a ThO_2 content of just over 7 per cent. Associated minerals are magnetite, ilmenite, garnet, and zircon. More extensive deposits containing monazite also occur on the east shores of the lake. The thorium content of this monazite, however, is only about 4.5 per cent—a grade which is not at present acceptable commercially.

Pyrochlore from the carbonatite complex at Nkombwa Hill is fairly rich in both uranium and thorium. Analyses of selected concentrates indicate about 2 per cent U_3O_8 and 0.5 per cent ThO_2 .

East Africa: Several of the carbonatite complexes discovered in recent years in East Africa contain thorium in pyrochlore and monazite. None of these deposits is rich

enough to be worked for thorium, but the element could be recovered as a by-product of niobium at some of the localities. Examples of carbonatites with appreciable thorium reserves are Sukulu (Uganda), Mrima (Kenya), and Mbeya (Tanganyika). At Sukulu, pyrochlore in soils contains about 2 per cent ThO_2 . Pyrochlore from Mrima contains 2 to 3 per cent thorium, while the monazite contains somewhat less than 1 per cent. Mbeya pyrochlore contains about 1.7 per cent ThO_2 .

West Africa: Monazite and thorite occur in the placer tin fields of Nigeria in considerable amounts, and can be recovered comparatively easily as a by-product of cassiterite. Reserves contained in ore which is likely to be mined over the next twenty years amount to over 2,000 tons of ThO_2 . The thorite, which contains up to 56 per cent ThO_2 , is normally produced in concentrates containing 5 to 6 per cent ThO_2 ; and the monazite, which contains about 6 to 8 per cent ThO_2 , is concentrated to a similar grade. By-product thorite is also obtained from the weathered portions of the Rayfield-Gona granites, which are at present being worked as a source of niobium. Production in 1957 totalled 93 tons and 1,054 tons of monazite and thorite concentrates respectively.

Ceylon: There are numerous small but rich heavy-mineral deposits on beaches on the west coast of Ceylon and at Pulmoddai, in the north-east of the island. The monazite from these localities carries about 9 per cent ThO_2 , and production at present is over 100 tons of concentrate per annum.

Malaya: Malaya, like Nigeria, has an important potential source of thorium as a by-product of tin. No detailed assessment of the field has yet been undertaken, but production in recent years has averaged over 400 tons of monazite, and could be maintained at this level for many years.

Kenya's Mineral Industry in 1958

DURING 1958 the total value of Kenya's mineral products showed an increase of nearly £500,000, and was approximately £4,305,159. The East African Portland Cement Co. Ltd. at Athi River came into full production in April, and produced 40,667 tons worth £486,642 and the British Standard Portland Cement Co. Ltd. at Bamburi produced 173,225 tons worth £1,408,900, so increasing the cement manufactured from local minerals to 213,999 tons at a value of £1,895,542.

Macalder Nyanza Mines produced slightly less copper than last year due to minor teething troubles in the mill. The total copper sold was 2,040 tons, valued at £394,881.

Products of the Magadi soda works were worth £1,408,190 of which £1,275,825 was accounted for by 111,058 tons of soda ash, and the remainder by 16,281 tons of salt. The Fundisha salt works produced 2,415 tons of salt valued at £14,360.

Gold output was somewhat higher than last year, 7,753 oz. troy realizing some £97,270. Refined silver showed a great increase, 44,146 oz. valued at £13,940 being produced, almost twice as much as the previous year. Macalder-Nyanza Mine almost trebled its 1957 gold output once teething troubles were overcome. A miner has made good progress in producing alluvial gold in the hitherto almost unprospected Elgeyo-Marakwet district.

G.F.K. Refractories continued to re-equip the mill and kyanite mine at Murka, between Voi and Taveta. Diatomite produced was 3,373 tons worth £59,523, whilst car-

bon dioxide gas showed an increase, 1,506,316 lb. worth £48,629 being produced. Graphite produced from the Shah Vershi Devshi Mine in South Kitui amounted to 659 tons worth £32,950. Production in small, or relatively small, quantities was achieved of columbite, felspar, gypsum, limestone, magnesite, meerschaum, pumice, quartz, salt from sea water, and vermiculite.

Investigation of the niobium-bearing prospect of Mrima Hill by the Anglo American Prospecting Co. (Africa) Ltd., ceased at the end of 1957. During the course of the year the Geological Survey mapped geologically over 13,000 sq. miles, bringing the total area so covered to approximately 104,000 sq. miles, or more than 46 per cent of the total area of the Colony.

MINERAL PRODUCTION

Minerals	Amount 1957	Amount 1958	Value £(1958)
Gold (refined) ...	7,387*	7,753*	97,269
Silver (refined) ...	23,051*	44,146*	13,940
Soda Ash ...	118,440†	111,038†	1,275,825
Copper (cement) ...	2,115†	2,040†	394,881
Salt ...	22,602†	18,696†	146,725
Diatomite ...	4,229†	3,373†	59,523
Graphite ...	942†	659†	32,950
Gypsum ...	29,076†	10,905†	44,589
Pumice ...	2,071†	773†	2,705
Kaolin ...	1,140†	1,185†	4,740
Asbestos ...	—	107†	3,500
Vermiculite ...	30†	86†	259

* Troy oz. † Tons.

Expansion of the Little Long Lac Group

REPEATED rumours that the United States will increase the price of gold, together with strength in the London market, have once again stirred new interest in the Canadian gold stocks.

This new assessment has created action in the old-established producers, some of which have been turning out bullion since prior to the first world war. Attention is also being directed to the handful of junior producers. And many of the latter have shown a new lease of life by the way of exploration and important additions to ore reserves.

The "glitter" of the golds has spread to the straight exploration and development companies, and more old and new prospects are being examined, shafts being sunk, and exploratory drives being made from neighbouring properties. Up to recent months, the Canadian gold industry had not been particularly aggressive in new programmes, but today both the financier and the developer are willing to proceed with gold participations.

During the past eight to ten years little interest revolved around gold participations, the industry concentrating its attention on iron ore, nickel, copper, and other base metals. During this period of gold "drought" an old-established gold organization, headed by new Canadian and American blood, started spreading its wings.

During this period the group used a depleting gold mine together with a \$250,000 investment to create a \$29,000,000 gold empire directly charged with the responsibility of operating eight mines yielding an estimated \$18,000,000 bullion annually.

The story, perhaps familiar throughout Europe and other continents, is nevertheless worthy of repetition, since it demonstrates that opportunities still exist for long-sighted executives.

The vehicle was Little Long Lac Gold Mines Ltd., an Ontario incorporation of 1933, which exhausted its ore reserves in 1953. Prior to this date a group consisting of Messrs. J. C. L. Allen, S. J. Bird, and J. George Boeckh, of Toronto, and R. C. Stanley, jun., New York (a son of the late head of International Nickel Co. of Canada Ltd.), stepped in and acquired control of Little Long Lac for \$250,000. The corporation's assets were then used to pyramid the corporation to Canada's second largest gold-producing organization.

By Claude H. Taylor

The quarter million acceleration to \$29,000,000 has also permitted diversification into other fields besides gold. Through purchase of directive control of corporations, the group is participating in the uranium industry and has directed attention to the search for nickel and iron ore.

The group's gold participations to date have been confined to Eastern Canada in centres well known and established as prolific producers of bullion.

Following acquisition of the vehicle—Little Long Lac Gold Mines Ltd.—the group moved into Perron Gold Mines, which automatically gave controlling interest in Bevcron Gold Mines and McKenzie Red Lake Gold Mines.

In this article our Canadian Correspondent traces the growth of the Dominion's second largest gold producing organization.

Perron's productive life proved short-lived, but its mill was used for a time to treat Bevcron ore. McKenzie later became a depleting proposition and then secured a new lease of life on discovery of new veins through aggressive exploration and development.

Turning point in this success story came with Little Long Lac's purchase of Lake Shore Mines, formerly one of the chief producers of the Kirkland Lake camp that never quite seems to reach the depleting stage. The well-heeled investment portfolio gave the group a major weapon for negotiation of other producing companies.

Lake Shore purchased a controlling interest in two more producers, namely Wright-Hargreaves Gold Mines in the Kirkland Lake camp and Malartic Goldfields in the Malartic district of north-western Quebec. Goldfields then acquired control of East Malartic Gold Mines, another successful gold producer in the Malartic district. Goldfields and East Malartic, together with others in the Little Long Lac family, acquired a controlling interest in Barnat Mines Ltd. The latter, another gold producer in the Malartic district, was fast approaching oblivion when a costly exploration-development programme paid off with a new orebody, substantially greater as to tonnage and grade than any heretofore found in the mine.

Goldfields later acquired control of Norlartic Mines, a prospect in the Malartic district. Extensive underground work there is now preparing an orebody for production and ore will be trucked for treatment in the Goldfields mill.

Within the past year Wright-Hargreaves purchased a block of shares in Macassa Mines, a long and successful producer in the Kirkland Lake district. This purchase, in turn, gave Wright-Hargreaves control of two Macassa affiliates. These comprise Renabie Mines, a gold producer in the Missinabi area of Ontario, and Bicroft Mines, a uranium producer in the Bancroft area of Ontario.

Bevcron Mines is currently directing underground development at Obaska Lake Mines, recently acquired in Quebec, and proposes shipping its gold ore to the Bevcron mill.

Besides the producing properties, the Little Long Lac organization owns many other companies, including former producers and straight prospects in the gold field. Also, the group has financed extensive search for iron through Belcher Mining Corp., owning substantial tonnage of low-grade magnetite on the Belcher Islands in James Bay, at the foot of Hudson Bay. Through Goldfields and Wright-Hargreaves, the group also controls Great Whale Iron Mines, owning another large deposit of magnetite located inland from the Hudson Bay region in Quebec.

Participations have also been taken in nickel exploration in the northerly reaches of Ungava and northern Quebec.

All in all, the practice of investing or speculating less money than the group secured through acquisition of other holdings has spelled successful accumulation of a gold empire totalling \$29,000,000.

Machinery and Equipment

Products of Joy-Sullivan's New Division

The formation of the new Air Power Division of Joy-Sullivan Ltd. is announced on page 614 of this issue. In selecting those equipments that initially are to constitute the Division's output, priority has been given to the products that are likely to find the widest and most immediate acceptance in the United Kingdom and overseas. It was necessary that the equipments be proved in design and established by reputation, but these attributes did not necessarily mean a merely repetitious production in the U.K. of mining tools widely used in the United States. Instead, the manufacturers emphasize the care with which Parent Company designs in the U.S. and Canada were selected with an eye to markets in Britain and elsewhere.

Three rock drills—known as the Speedline models—are among the first of the new products to be manufactured by the newly-inaugurated division. Like all other equipment in this new Joy-Sullivan range, they will be manufactured at the company's Cappelw factory, in Greenock.

The drills are the L.37 in the 35 lb. class and the L.47 hand-held model. The AL.47 for airleg mounting and the "Airleg" itself known as the JAL, can be supplied as a complete unit known as the JAL.47. All drills coded 47 are in the middle-weight 50 lb. class. Speedline drills are available for wet or dry drilling and incorporate a number of unique design features giving maximum efficiency over long periods with little maintenance.

The dual valve used in the Speedline drills means that each valve works independently of any other, supplying metered air at exactly the right moment. Providing positive air control on both up and down piston strokes the dual valve gives the drills "cushion-control". Cadmium plating is another feature of the Speedline drills and this provides an aid to normal lubrication.

The L.37 Speedline drill weighs 37 lb. dry and 39 lb. wet and is 17 in. in length. Standard chuck size is $\frac{3}{4}$ in. hex. x $4\frac{1}{2}$ in. The air hose used is $\frac{3}{4}$ in. and the thread size on the air inlet is $\frac{1}{2}$ in. On the wet type a $\frac{1}{2}$ in. water hose is used with a water inlet thread size of $\frac{1}{2}$ in. female. The L.47 and AL.47 models weigh 50 lb. dry and 52 lb. wet, with an overall length of 22 in. Standard chuck size of both models is $\frac{7}{8}$ in. hex. x $4\frac{1}{2}$ in. with an alternative of 1 in. hex. x $4\frac{1}{2}$ in. Air hose size is $\frac{3}{4}$ in. with the air inlet thread size being $\frac{1}{2}$ in. thread female on the water inlet. The JAL Airleg weighs 32 lb. and has a feed length of 48 in.

The rated capacity of the L.37 is eight feet, but this can be deeper in easier going. The drill is undemanding on air requirements—where the air supply is limited to a 160 or 315 cu. ft. min. compressor, two to six L.37 drills can be operated. The hand-held L.47 goes down to 10 ft. and can drill easily to 14 ft. in favourable conditions. Economic in operation the L.47 drill can be used in soft, medium and medium-hard rock formations. Basically

identical with the L.47, the AL.47 is used for airleg operation, particularly useful on long drifting operations.

Now available from British manufacture by the new division is the Joy-Sullivan WN.112 Two Stage V-Vertical Stationary Compressor. Already an established machine in the U.S. and other parts of the world, the WN.112 is stated to provide minimum adjustment and maintenance, high overall efficiency, long service life and compactness for small foundation. Four variations of the compressor will be available, offering a choice of capacity from 400-850 cu. ft. per min. free air delivered. Operating at the relatively low speed of 600 r.p.m., they provide a delivery pressure of up to 125 lb. p.s.i.

The V-Vertical construction of the WN.112 means that it requires very little floor space. A flange-mounted motor helps to keep space requirements down. Installation is simple and no involved piping is required.

For mine and construction work where large supplies of air are required for long periods but not permanently, the WN.102 semi-portable compressor is available. Skid-mounted and with self-contained cooling this machine can be readily transported from site to site. The WN.102 incorporates all the features of the WN.112 in portable form.

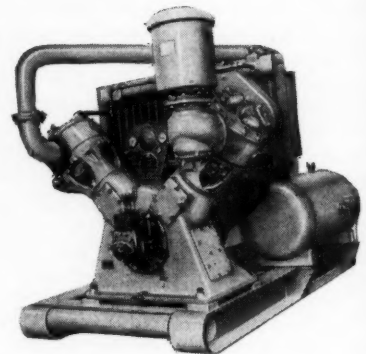
Compact in size it takes up little space—an important consideration in many mining jobs. In tunnelling work it is especially useful as it can be moved forward to follow the advance of the operation.

A built-in safety circuit which shuts off the engine if there are symptoms of high engine water temperature, low engine oil pressure or high compressor discharge temperature, is a feature of the Airvane RP.365 Rotary Portable Compressor now available from the division.

The safety circuit is one of the more unusual features of the compressor. It was incorporated to minimize the danger of major breakdown through carelessness—failure to top up the radiator, or to check on oil levels in the engine or the compressor oil sump and failure in the radiator-oil cooler system. At the first sign of trouble from any of these sources the closed-type electrical safety circuit shuts off the engine so that the trouble can be located. Even a fracture in the wiring system will actuate the safety mechanism and stop the engine.

Another exclusive Joy-Sullivan feature on the Airvane RP.365 is the Thermal By-pass Oil System. With this, the compressor can be operated in temperatures well below zero without any worry about compressor oil temperature. The thermal by-pass valve automatically supplies warm oil to the compressor and then maintains it at the ideal operating temperature regardless of outside conditions.

Besides the new products to be manufactured by the Air Power Division, a wide range of the company's existing products will be available to users of air



power equipment. Single and double drum hoists have always been in the Joy-Sullivan range, the smallest being the AW-80 single drum type. Powered by a four cylinder reversible air motor it has a rope pull of 750 lb. The AW-80 weighs 85 lb. and can be carried by one man. Air consumption is 35 cu. ft. per min. and rope speed 30 f.p.m. The EW-111 single drum hoist is powered by a five-cylinder reversible Pistonair motor and has a maximum rope pull of 2,000 lb. Rope speed is 70 f.p.m. A compressed air motor of $7\frac{1}{2}$ h.p. powers the F-113 single drum hoist. Driven through epicyclic gearing it has hand-operated brake and clutch bands. A rope pull of 2,000 lb. is provided at a speed of 125 f.p.m.

One of the most versatile haulage machines of its type is the Joy-Sullivan N.221 double drum slusher which can be supplied with either turbine or piston type air motors. Rope speeds vary between 214 and 285 f.p.m. and rope pull ranges from 2,200 to 4,500 lbs. according to the size of motor used. The N.221 Slusher, with similar capacities to the N.221 can be offered where in-line drive is required.

Lightweight and medium weight wagon drills have been produced by Joy-Sullivan Ltd. for some years and have proved popular in many parts of the world. Designed for one-man operation, the lightweight UW.180 drill increases the footage of a heavy hand held drill by 50 to 80 per cent. The drill does not have to be held or guided while the four-cylinder reversible air motor is mounted on the guide with controls within easy reach of the operator. Positive chain feed is used on the drill while the slide carriage can accommodate any type of drill or drifter.

The medium weight UW.181 drill is suitable for drifters up to 4 in. piston size. Like the lightweight drill the universal type saddle mounting means holes can be drilled at any angle. A four-cylinder "Piston motor" feed unit is fitted and hydraulic control is a feature making for quick and easy positioning of drill and feed.

Two shovel loaders are marketed by Joy-Sullivan Ltd. The HL-3 has a capacity of one to two tons per min.,



At left, opposite, the WN.102 semi-portable compressor. Above, the 50 lb. L.47 Speedline rock drill. Both equipments are products of the newly-formed Air Power Division of Joy-Sullivan Ltd.

while the HL-20 can handle two to three tons per min. The Joy Scraper Loader is available in two models to handle either 36 or 54 in. scraper buckets. The machine is constructed to allow the 36 in. model to be converted into a 54 in. unit by the substitution of lateral members and floor plates. The 36 in. Loader will handle 30 tons per hour using a rope speed of 244 ft. per min. The 54 in. machine, using the larger bucket, will load up to 50 tons per hour. Both models will work at full capacity against gradients of 1 in 3.

THE "TRANSMATIC" DRIVE IN MINING

On Tuesday last week, members of the Technical Press were given the opportunity of seeing certain units equipped with hydrostatic transmission at the Ashchurch plant of Dowty Hydraulic Units, Ltd. Many of these units have application in the mining industry, the new Transmatic drive offering wide scope in many mining equipments.

"Transmatic" drive is the trade name for the hydrostatic transmission developed by Dowty Hydraulic Units, Ltd. The progress of the drive has continued over four years and the position has now been reached where applications of this drive were considered available for demonstration, amongst them being the 48 DH Locomotive—narrow-gauge diesel locomotive produced by Ruston and Hornsby Ltd. Now that the technical development of the transmission has been completed other applications will quickly follow.

Hydraulic power transmissions can be divided into two distinct types, hydrokinetic and hydrostatic. In the former, the kinetic energy of a high velocity flow of oil is utilized and such a transmission employs a centrifugal pump which delivers the fluid to a turbine wheel. Such arrangements are usually linked to multi-speed gearboxes in order to provide an adequate torque multiplication without serious loss of efficiency. On the other hand, the hydrostatic power transmission uses high pressures and relatively low velocities but no gearboxes. The system utilizes two multi-piston

type units, with variable displacement characteristics. The principles involved have long been known, but only recently have units been developed combining sufficient power with acceptable weight and size for use in vehicles.

The Transmatic drive is claimed to offer advantages unmatched by any other form of transmission. These advantages include a single-lever control, which actuates the complete range of movement from full ahead to full astern. This simplicity leads to greater safety in operation and lessens driver fatigue. A stepless transmission avoids the difficulty of changing gear when under load. Vehicles can be inched forward and speed increased until the optimum engine output is achieved. The elimination of many parts, including the mechanical drive line, gear-shift system and reversing mechanism, allows great flexibility in vehicle design and better space utilization. Manoeuvrability under difficult conditions, such as steep inclines and poor holding ground, is exceptional and beyond comparison with that of any conventional drive.

Of marked interest is the fact that the hydrostatic Dowty transmission is being tested in a new Ruston locomotive, the Mark 48DH, now being developed. Operational trials with this 48DH locomotive using the hydrostatic transmission have been extremely satisfactory. This 48DH locomotive, which is testing the hydrostatic transmission is practically identical to Rustons' 48DL model except that the 48DH is fitted with a 4YDA air-cooled diesel engine from Rustons' most recent air-cooled range, and the new locomotive when introduced in the near future will incorporate this 50 b.h.p., 1,800 r.p.m. engine as the ultimate power unit. The Dowty transmission system provides the hydrostatic drive between the engine and reduction gearbox.

SUSPENSION MAGNETS

The conventional method of extracting tramp iron from feeds carried by conveyor is by magnetic pulley. In certain circumstances due to abnormal feed depths, conveyor speeds, installation difficulties, the type and quantities of iron encountered, it is advisable to use suspension magnets or a combination of both magnet and pulley.

The circular suspension magnets manufactured by Rapid Magnetic Machines Ltd., are designed to meet many varied needs. The inherent feature of deep impinging high intensity magnetic fields makes possible the effective extraction of tramp iron from coal, limestone, slag, gypsum, ore and similar materials carried by conveyor or chute.

The magnets are suitable for use with horizontal or inclined conveyors and may be installed without major plant modifications, above and parallel to the conveyor or angularly disposed at the terminal head. They are ideally suitable for applications involving large feed depths, and those travelling at speeds too fast or slow to be handled by magnetic pulleys. This type of magnet is not self-cleaning and must be "switched off" before the extracted iron can be discharged. Arrangements can be made for the magnet to be suspended from a travelling trolley which enables the magnet to be swung clear of the conveyor prior to discharging the extracted iron. Where large quantities of tramp iron are regularly encountered, it is sometimes preferable to install a self-cleaning type extractor.

The suspension magnets manufactured by Rapid Magnetic Machines Ltd. are the subject of an interesting pamphlet recently released by the company.

PROTECTION WITH COMFORT

Made from a high-pressure moulding of glass-fibre reinforced polyester-resin, the Skullgard protective helmet, now being produced by Mine Safety Appliances Ltd., offers excellent protection against head injuries with a high degree of comfort. Manufactured to British Standard 2826:1957, the Skullgard is completely water resistant, while colour fastness is guaranteed by employing dyed in the mass material.

Two types are available: one is for general industrial use, and comprises the shell and harness; the other is for the mining industry, and this provides the shell fitted with lamp bracket, cable clip, and harness. Both types are available in small and large shell sizes accommodating from 6½ to 7½ and from 7½ to 7½.

The harness is made from strong and durable cotton webbing incorporating a Basil leather sweatband and nylon laces.

A 7½ ton narrow gauge diesel locomotive, the Ruston and Hornsby 48DL model, fitted with the Dowty Transmatic drive. The unit is seen undergoing trials, hauling sand and gravel



MINING MISCELLANY

The Dominican Republic marble quarrying company of Marmoleria Nacional has announced that with new cutting and quarrying machinery its production will be doubled. For the first time cladding marble will be exported in large quantities.

U.S. Government approval of a new anthracite mine-water-control project, designed to protect "hard-coal" reserves totalling over 11,000,000 tons against flooding, has been announced by the Department of the Interior. Expected to cost about \$146,000, in Federal and State funds, the project will involve filling 21 abandoned stripping pits near Olyphant, Pennsylvania, with more than 1,000,000 cu. yds. of dirt and other mine refuse from nearby spoil banks.

Coal imports into Burma amount to about 250,000 tons per year. Low-quality coal is at present being mined at Kalewa in Upper Burma at 300,000 tons annually. The expected life of the Kalewa mines is, however, only 16 years even at the present low production rate. Prospects for economic exploitation are not good, mainly because of the high transport costs to the demand centres in the Rangoon area, and it is understood that the latest recommendation is to suspend operations at Kalewa.

The prospective Norwegian iron ore producer, Rana Gruber A/S, announces that it has finished its building ground investigations at Gullsmedvik, and will soon present to the government its plans for an iron ore mill. The pilot mill at Storforshei in direct connection with the mine is in full operation.

The Mosjøen Aluminium A/S, a subsidiary of the Norwegian holding company Elektrokemisk A/S, has been granted a further supply of electric power from the State power plant of Rössaga, increasing the delivery to 640,000 kWh./year. Accordingly, the capacity of the aluminium plant will be raised to 32,000 tonnes a year.

Under the auspices of the Ministries of Works and Development, and in co-operation with Israel Mining Industries Ltd., a mining school will be opened at the Negev town of Eilat as a training centre for workers in mines and quarries, and also those employed in excavations. The necessary training personnel will be provided by the Haifa Technion, Israel Institute of Technology, which will, in addition, place its relevant laboratories at the disposal of the Eilat school.

A third shipment of 700 tons of copper cement has recently left the Timna Copper Works, Israel, for a European destination, and another consignment will be sent by the end of May.

Surveys made at the Rio Blanco copper deposit in the counterforts of the Andes Cordillera show the presence of 96,000,000 tons of copper ore with a content of 1.6 per cent. Representatives of the Cerro Pasco Corp., which under-

taking owns the deposits, stated that these would come into production in about five years' time, and that the extraction capacity would not be less than 10,000 tons of ore per day.

The Sociedad Mixta Siderurgica Argentina has bought 500,000 tons of iron ore in Chile, Peru and Brazil, for \$6,500,000. The ore is destined for the San Nicolas steel works, where the first blast furnace should be completed soon, and should start production at the end of the year.

The Geological Survey of India has located in the Baramulla District, in Kashmir, very large reserves of graphite. The Survey has recommended that the preliminary investigation should be extended to other deposits in the area. It has recommended also, in relation to the deposits already located, that preliminary work should include detailed surveying on a larger scale, to determine the exact reserves and demarcation of the better quality bands in the deposits.

The Thailand Mines Department have announced that the Krupp Survey made last year reported a 1,000,000 ton iron ore deposit at Im Krim in the Kanchanaburi area, roughly eighty miles west of Bangkok. This would be sufficient to support a steel works with an output of 300 tons a day. The cost of such a works would be about 1,000,000,000 Baht (roughly £17,500,000), which it is beyond Thailand's present capacity to finance. Krupps, while prepared to build such a steel works, are not prepared to finance or run it, and other foreign investors

may be invited to provide the necessary capital.

Soviet News reports that a single controlled explosion at the Yuzhny open-cast iron mine, in the Krivoi Rog Basin, threw up 1,200,000 tons of ore. The explosive used for this operation was 170 tons of T.N.T. and ammonite, placed in 291 holes, each 60 ft. deep.

Deposits of soft coal in the north of Mexico have been found to amount to approximately 3,000,000,000 tons, according to Ing. Gutierrez. He has added that exploitation of these deposits may well mitigate the ever-increasing demand for petroleum products.

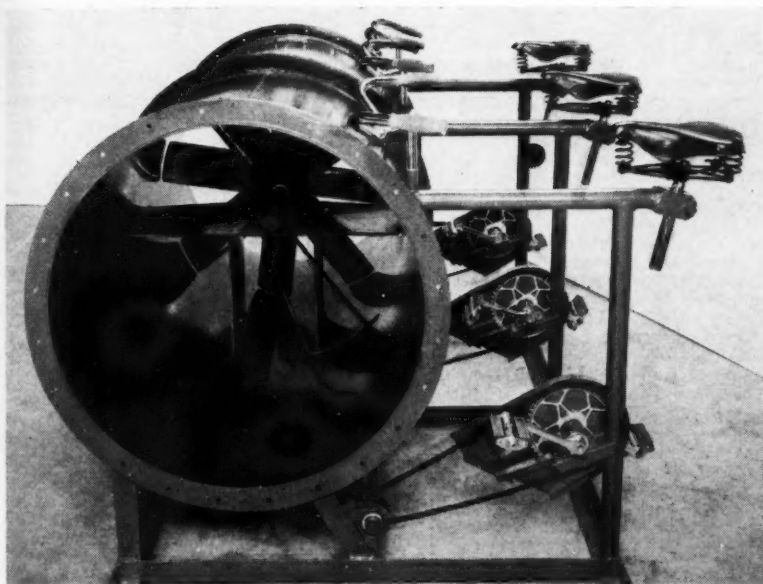
A new type of turbodrill has recently been put into operation in the Tatar Autonomous Republic, reports *Moscow News*. It is only a small fraction of the weight of all the old types of turbodrill, because all the main components are made of plastic materials, that used for the cutters proving harder than steel. The use of this turbodrill has enabled the rate of drilling to be increased.

Gold production in Formosa should reach 40,000 oz. per annum soon. The government-operated Taiwan Metal Mining Corporation is to open up new gold mines at a cost of \$NT4,000,000.

The new building in Canada to house the Toronto Stock Exchange is to consist of a ten-storey office block, and plans for the future include a 27-storey interconnected building. The location will be on the corner of King and

Model of Thompson Townsite showing how full advantage has been taken of the natural setting along the banks of the Burntwood River. Thompson, which serves the new Manitoba project of the International Nickel Company of Canada, is on the way to becoming one of the most modern and attractive communities in Canada. Three distinct residential areas as well as an industrial area have been planned around the central business section. The railroad siding and station are located to the east of the town and are connected by a road which leads directly into the business area. Plans of the town have been completed on the basis of a population of 8,000 people. To date, 120 houses are occupied





Since its inception in 1935, the Fan Engineering side of the Aircrow Company and Jicwood Ltd., has been called upon from time to time, to design and produce unusual fans. One of the most recent requests came from the National Coal Board. It was for a manually operated fan to provide emergency ventilation in British mines when electric power was unavailable. The result, as the photograph shows, is a combination of fan and 3-man-bicycle, with pedals providing the power. The fan has a 30-in. dia., eight-bladed wood impeller with an output of 8,000 cu. ft. per min. against a resistance of 0.3 in. when running at 720 r.p.m. The gearing, of standard bicycle type, has been designed so that a crank speed of 68 r.p.m. will give the fan its speed of 720 r.p.m. The mine in which this prototype fan will be tested has not yet been selected.

Church streets, Toronto, and the building should be completed by early 1962. A letter of intent has been received from the Fenston Group of London, England, to submit proposals for the new home by October 1 this year.

The D.S.I.R. Technical Digests are to return to the field of available literature in the next few weeks. D.S.I.R. devotes considerable time to helping industry, especially the smaller units, to bridge gaps in scientific "know-how". The Technical Digests should be valuable in pinpointing new ideas and the sources of information about them. They will be published monthly as a small compendium of ideas, each presented on a separate sheet of paper.

Benguet Consolidated Inc. has signed a contract under which it acquires the right to explore and possibly purchase 138 mining claims owned by the Kennon Road Copper Mines Inc., around camp 4 along Kennon Road, near Baguio, Philippine Islands. Benguet will have until September 30 next year to explore the tracts and decide whether to buy them for 2,000,000 pesos. The area is regarded by experienced mining men as "promising" in regard to both copper and gold.

The Philippine Bureau of Mines is seeking \$502,625 in aid from the United National Special Fund for geophysical and geochemical surveys of little explored regions in the Philippines, including a general reconnaissance geological map-making project, supplemented by photogeological studies, and the estab-

lishment of a coal-testing laboratory and pilot plant. Benjamin M. Gozon, Director of the Bureau of Mines, in pointing out the feasibility of such surveys, said that very little of the Philippines has been surveyed since 1895. He estimates that only 20 per cent of the country has been covered by reconnaissance and detailed geologic mapping.

In the second half of last year, 200 field teams, comprising some 14,000 members of the teaching staff and students at the various geological institutes and schools in China, carried out a scientific prospecting campaign over an area bigger than France. In the course of their survey, which involved examination of over 10,000 deposits, they are said to have located more than thirty economically interesting deposits of coal, iron, copper, lead, and zinc. The campaign has now been resumed by some 10,000 participants, 4,000 of whom are from Peking, spread over a wider area, and it will continue over the next three or four months.

The Bulgarian newspaper, *Rabotnichesko Delo*, reports that work is proceeding near Madzharovo, in the district of Khaskov, on the erection of a new flotation plant of considerable, but unspecified, capacity.

Mr. Harry Oppenheimer, chairman of De Beers Consolidated Mines Ltd., recently handed to the chief secretary, Mr. J. Fletcher-Cooke, a cheque for £20,000, being a gift from De Beers "for the furtherance of sport in Tanganyika". Mr. Oppenheimer said the gift was in-

tended to mark De Beers' association with Tanganyika as joint equal shareholders with the Tanganyika Government in Williamson Diamonds Ltd.

We are advised by L. M. Van Moppes and Sons (Diamond Tools) Ltd. that the illustration of Stonehenge in their advertisement in *The Mining Journal Annual Review* was published by permission of the Ministry of Works. They advise also that the illustration showing work on a concrete dam face was by permission of Soil Mechanics Ltd. L. M. Van Moppes and Sons worked in close association with these organizations in the two projects.

Coming Events

A Symposium on "Wet Processing of Minerals and Industrial Products", which has been arranged by the Adelaide branch of the Australasian Institute of Mining and Metallurgy, will be held in Adelaide, South Australia, from February 16 to 19, 1960. The Symposium will be opened by two prominent authorities, who will deliver review papers on hydrometallurgy, one embracing the field of fluid mechanics, the second covering the unit operations. The technical programme will comprise approximately twelve papers. Other activities during the Symposium will be the inspection of plant, including the Research and Development Section of the South Australian Department of Mines, open forum discussions on the various technical subsections, and social functions.

At the Mond Nickel Company's exhibition to be staged at the Cutler's Hall, Sheffield, from June 2 to June 5, one of the most interesting features will be a working model of a rhodium plating plant. This model is the first automatic rhodium plating plant ever built, and it has been specially designed for the exhibition. The plant, one of the latest demonstrations developed by the company, has a capacity of 240 items an hour, and handling eight items at a time completes the plating operation in two minutes.

The 66th annual general meeting of the Institution of Mining Engineers will take place in London at the Institution of Naval Architects on January 28, 1960.

At a meeting of the North of England Institute of Mining and Mechanical Engineers to be held on August 6, 1959, at the Institute, Neville Hall, Newcastle upon Tyne, the subject will be "Hydraulic walking supports with the Anderton Shearer". The talk will be given by R. R. G. P. Jackson, Assoc. M.I. Min. E., and J. T. Harding, B.Sc., M.I. Min. E.

The widespread use of plastics in industry will be well illustrated at the International Plastics Exhibition being held at Olympia, June 17 to 27. Fifteen of the twenty-four new colour films being shown are devoted to industrial applications. In coal mines, it will be demonstrated how the flame-resistant qualities of plastics make them invaluable for conveyor belting, ventilation ducting, protective clothing, electrical insulation, and pit-prop caps. Three hundred firms (including over fifty from overseas) will show their products.

Metals and Minerals

Russia's Ambitious Aluminium Programme

About a year ago, when aluminium of Soviet origin was appearing in increasing quantities on world markets, an article published by the Reynolds Metals Co. pointed out that the Soviet bloc of nations now accounted for approximately 22 per cent of world aluminium production and that the current capacity of this group was likely to be doubled by 1961. According to Reynolds, the combined output of the U.S.S.R. and its satellite nations had risen by 1957 to an estimated 710,000 tons annually. Informed observers predict that the Soviet bloc will produce 1,430,000 tons of aluminium annually by 1961.

Uneasiness regarding the role of the aluminium industry in Russia's economic and political planning will not have been lessened by a report in *Engineering and Mining Journal* that the U.S.S.R. is counting on a new process to extract alumina from nepheline, and on the rapid development of electrical power, to become the world's largest aluminium producer by 1965.

Although a veil of secrecy has surrounded the post-war development of the Soviet aluminium industry, it has been lifted sufficiently to reveal a hoped-for production of 3,352,580 tonnes by 1965. (At the present time U.S. aluminium producers have facilities to produce 2,209,250 s.tons, but in 1958 they operated far below capacity, producing 1,557,000 s.tons).

Russia claims to possess extensive deposits of raw materials for aluminium production, but bauxite deposits are considered to be limited, although new occurrences have been discovered in recent years in the southern part of the country.

In 1957, the Russians began extracting alumina from nepheline, which, it has been stated, has about 50 to 67 per cent of the alumina content of bauxite and is more difficult to process. The U.S.S.R.'s resources of this material are reported to be "very large". In the new extraction process to produce alumina from nepheline, soda ash, potash and cement are produced as by-products.

Output of electrical power—especially in the Urals, Siberia and Central Asia—is scheduled to increase by 2.2 times over the 1958 level under Premier Khrushchev's Seven-Year Plan. The aluminium industry is scheduled to increase by 2.8 times by 1965.

While the potential threat to the aluminium markets of the Free World can certainly not be discounted, it is perhaps pertinent to point out that, in terms of per capita consumption, Russia has a long way to go before she catches up with Western standards. On the other hand, a production by 1965 of 3,352,860 tonnes of aluminium would be sufficient to provide for a consumption of over 30 lb. per head of the Russian population. In 1957, per capita consumption in the U.S. was estimated at some 21 lb. annually, while Switzerland and the U.K. were estimated to consume 15 lb. and 13 lb. per head respectively. This certainly makes one think!

Kaiser Aluminium plans to increase its

operations to a total annual level of 524,500 tons—the highest in its history. This would be the third production increase within six weeks and is to be achieved by reactivating a potline at the company's Mead, Washington, reduction plant, for the addition of another 22,000 tons. This increase is due to the continuing strong demand for primary aluminium and aluminium mill products.

It is further reported that Kaiser has started production at its new \$70,000,000 plant at Gramercy (La.), which has an annual output of 430,000 tonnes of alumina.

CANADIAN THORIUM PRODUCTION

The Elliot Lake thorium plant of Rio Tinto Dow Ltd. is now in regular production of all planned products. Trial shipments of the various products have been made and the plant is established as a major new source of thorium raw materials. This plant, which was constructed at a cost of approximately \$1,000,000, represents a new industry in Canada and a new world source of thorium raw materials.

The operations are based on the use of solvent extraction for the recovery of thorium from the waste liquors produced in the extensive uranium milling operations of the Blind River area. This first operating unit is located adjacent to the Quirke Mill of Algom Uranium Mines Ltd. and, at such time as the market warrants further production, units can readily be constructed to take advantage of the waste solutions from other mines in the area.

TURKISH CHROME PRICE

A new chrome ore export price of \$33.50 per ton has been fixed by the Turkish Chrome Committee. In the past the price has never been lower than \$40.

KOREAN TUNGSTEN PLANT

A modern tungsten processing plant, capable of processing tungsten middlings into high percentage scheelite, amounting to 5,000 tonnes a year, has been completed in South Korea. Built by the U.S. Utah Construction Co. at a cost equivalent to £1,280,000, it will raise the percentage of tungsten components to 90/95 per cent from the current 60 per cent.

The plant is managed by the State-owned Korean Tungsten Co., whose property is one of the largest mines in the world with known ore reserves of about 5,000,000 tonnes. Hitherto, the company has used an acid processing method with unsatisfactory results in eliminating such impurities as molybdenum and sulphur in the tungsten component. The new plant will solve this problem.

Since reaching 98s. 6d.—103s. 6d. per

1-ton c.i.f. Europe on May 21, wolfram ore shipment prices in London have remained unchanged. Although demand is quiet sellers are not currently pressing, but unless buying interest improves, some softening in prices before long cannot be ruled out.

DRIVE FOR URANIUM MARKETS

A concentrated drive will be made this year for development of foreign markets for Canada's refined uranium products, states the 1958 report of the government-owned Eldorado Mining and Refining Ltd. Exhibits will be placed in five international trade fairs to attract purchasers.

The report adds that in 1958 combined deliveries from 14 companies of 11,797 tons of uranium oxide in concentrates valued at \$239,190,000 and Eldorado's own concentrates amounting to 1,740 tons of uranium oxide valued at \$35,226,000 have put Canada in the forefront of uranium producers in the Free World.

Capital expenditures by Eldorado in 1959 will amount to about \$1,750,000. Some \$300,000 will be spent on airborne geophysical exploration supplemented by surface exploration over an area of 3,500 sq. miles north and east of Port Radium.

CADMIUM IN 1958

The supply of cadmium metal in the United States in 1958 exceeded demand by 23 per cent, according to the Bureau of Mines, U.S. Department of the Interior. Total supply, consisting of primary and secondary metal production at domestic plants and imports of metal, was 5,350 s.tons, being 12 per cent below 1957. Demand, as measured by apparent consumption, was 4,100 s.tons, 26 per cent below 1957. Industry stocks increased by 47 per cent to 3,100 s.tons. The quoted price for cadmium delivered in 1- to 5-ton lots declined on September 24 from \$1.55 to \$1.45 per lb., at which level it closed the year.

Cadmium metal imported for consumption was about 500 s.tons, being 37 per cent lower than in 1958. Imports of flue dust, cadmium content, fell by 13 per cent to 600 s.tons.

Estimated world output of cadmium in 1958 was 9,925 s.tons. The United States contributed 49 per cent of the total by processing foreign and domestic ores and flue dusts. Canada accounted for 920 s.tons, Belgium for 744 tons, the Belgian Congo for 537 tons, and the U.S.S.R. for 520 tons.

U.K. MANGANESE IMPORTS

A subdued tone continues to prevail in the manganese ore shipment market. Available supplies are described as more than adequate to meet the reduced demand, which still shows little sign of picking up within the foreseeable future. Stocks in consumers' hands on both sides of the Atlantic remain substantial.

For the first three months of this year, United Kingdom imports of ore from all sources totalled 73,792 tons, according to B.O.T. figures, being thus well below the 134,420 tons brought in during the corresponding period of 1958. All the principal suppliers sent less. The Soviet Union, for instance, shipped 25,143 tons compared with 50,174 tons; Ghana,

25,148 tons (37,750); and India, 17,838 tons (29,922).

As has been previously pointed out, United Kingdom ore requirements are fully covered for this year. Since the intake matches industry's needs, the substantial stocks held, mainly high grade, are not likely to be reduced for the time being.

★

Japanese ferromanganese makers have contracted to import a total of 20,000 tons of 48 per cent manganese ore from the U.S.S.R. this year. The import price

of the ore was fixed at \$37.50 U.S. per ton c.i.f. Japan.

A Brazilian company, which supplies manganese ore to the United States, is reported to be seeking an export outlet in Japan for its ore, and has approached a leading firm, the Mitsui Bussan Kaisha. The Brazilian firm is reported to be capable of supplying between 30,000 and 50,000 tons of manganese ore annually to Japan. However, the export price of the ore is considered to be too high for acceptance by Japanese makers at present.

COPPER • TIN • LEAD • ZINC

(From Our London Metal Exchange Correspondent)

Although there has been a slight reaction during the week in copper, tin values have edged higher, but it has been an uneventful week on the market, with no fresh factors either from the United States or the Continent. Generally speaking, there is a feeling of hesitancy, but the undertone remains satisfactory.

COPPER BACKWARDATION NARROWER

The reaction in London earlier in the week followed a sharp break on the Commodity Exchange futures market, which in turn was due to a decline on Wall Street rather than to any other reason. Continental demand can best be described as no better than routine, and the absence of the recent influential support for copper for prompt delivery has resulted in a marked narrowing in the backwardation on the London Metal Exchange. At the same time, stocks at the end of last week increased substantially by 1,382 tons to 12,898 tons.

In the United States consumer demand for both producer and customs smelter copper at 31½ c. and 32 c. respectively for pre-July delivery continues in excess of available supplies, but there is no inclination as yet to switch to dealer metal at around 33 c. It has been reported that United States brass mills are likely in the near future to make a formal request for rising imports to be restricted by means of tariff relief, but there seems little likelihood that their efforts will meet with success.

The negotiations between the United States domestic mining and refining companies and the unions concerned for a new labour contract have passed beyond the preliminary stage, and are entering a more serious phase. It is not known what the unions have in mind by the "substantial" wage increase they are seeking, but apart from this a number of cost-increasing supplementary demands have been tabled. As is already clear in the case of the steel industry, these negotiations will prove long and arduous, with strong opposition from the

industry, and the question still remains as to what action will be taken at the end of this month in the absence of any agreement being reached.

I.T.C. RAISES QUOTAS

At the end of last week, the International Tin Council meeting in Copenhagen closed with the issue of a communiqué announcing an increase of 2,000 tons to 25,000 tons in the third quarter 1959 tin export quota. This step was welcomed by the six producing countries concerned, although it was appreciated that the increase might have been larger but for the possibility of a strike in the United States steel industry having to be taken into consideration, together with the decision that the United Kingdom Government stocks of 2,500 tons would be disposed of over an unspecified period through the buffer stock manager.

Other points mentioned in the communiqué included the decision to extend the buffer stock manager's authority to operate within the £780 to £830 price range, and the disclosure that stocks on hand in the buffer pool at the end of December totalled 23,325 tons. However, trade estimates indicate that this figure has meanwhile been reduced by some 6,000 tons. The market reacted favourably to the overall picture, with consumers showing increased interest, particularly in the United States, where offerings for nearby delivery were scarce.

Shipments from Singapore during May were only 15½ tons compared with 25½ tons in April, whilst comparative figures from Penang were 3,998½ tons compared with 2,535½. Stocks in United Kingdom official warehouses fell sharply at the end of last week by 451 tons to 7,664 tons.

On Thursday morning, the Eastern price was equivalent to £815½ per ton c.i.f. Europe.

LONDON METAL AND ORE PRICES, JUNE 4, 1959

METAL PRICES

Aluminium, 99.5%, £180 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £190 per ton
Crude (70%) £190 per ton
Ore (60%) bases 19s. 6d./20s. 6d. nom. per unit, c.i.f.
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 9s. 0d. lb.
Cerium (99%) net, £16 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 14s. lb.
Germanium, 99.99%, Gs. kilo lots 2s. 5d. per gram.
Gold, 249s. 8d.

Iridium, £23/£25 oz. nom.
Lanthanum (98/99%) 15s. per gram.
Manganese Metal (96% - 98%) £245/£250
Magnesium, 2s. 3d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £21/£23 oz. nom.
Osmiridium, nom.
Palladium, £6 10s./£7 10s.
Platinum U.K. and Empire Refined £28 10s. oz.
Imported £27/£27½
Quicksilver, £77½ ex-warehouse
Rhodium, £41/£45 oz.
Ruthenium, £18/£20 oz. nom.
Selenium, 50s. 0d. per lb.
Silver, 78½ d. f. oz. spot and 78½ d. f'd
Tellurium, 15s./16s. lb.

ORES AND OXIDES

Bismuth 30% 5s. 6d. lb. c.i.f.
20% 3s. 3d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (semifriable) 48% (Ratio 3:1) £15 15s. 0d. per ton c.i.f.
" Hard Lumpy 45% (Ratio 3:1) £15 10s. 0d. per ton c.i.f.
" Refractory 40% £11 0s. 0d. per ton c.i.f.
" Smalls 44% (Ratio 3:1) £14 0s. 0d. per ton c.i.f.
Baluchistan 48% £11 15s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade nom.
Fluorspar—
Acid Grade, Flotated Material £22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF₂) 156s. 0d. ex works
Lithium Ore—
Petalite min. 34% Li₂O 40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 34% Li₂O 40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li₂O £25 0s. per ton f.o.b. Beira
Magnesite, ground calcined £28 0s./£30 0s. d/d
Magnesite Raw (ground) £21 0s./£23 0s. d/d
Manganese Ore Indian—
Europe (46% - 48%) basis 57s. 6d. freight nom.
Manganese Ore (43% - 45%) nom.
Manganese Ore (38% - 40%) nom.
Molybdenite (85%) basis 8s. 11d. per lb. (f.o.b.)
Titanium Ore—
Rutile 95/97% TiO₂ (prompt delivery) £31/£33 per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO₂ £11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%) 98s. 6d./103s. 6d. per unit c.i.f.
Vanadium—
Fused oxide 95% V₂O₅ 8s./8s. 11d. per lb. V₂O₅ c.i.f.
Zircon Sand (Australian) 65 - 66% ZrO₂ £17 0s. ton c.i.f.

LEAD-ZINC LITTLE CHANGED

Lead and zinc values so far during the current trading period have shown little movement, with the contango in the case of lead and the backwardation in the case of zinc unchanged. Demand generally continues very satisfactory, particularly for high-grade zinc, which is in short supply. Again it may be stated that a rise in both United States quotations would have been justified but for the already wide spread between New York and London, as far as lead is concerned, and the possibility of a steel strike in the United States in the case of zinc.

Closing prices up to midday, June 4, are as follows:

	May 28		June 4	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash	£241	£241½	£240½	£240½
Three months ..	£240½	£240½	£239	£239½
Settlement	£241½		£240½	
Week's turnover ..	11,125 tons		7,925 tons	
LEAD				
Current ½ month ..	£70½	£70½	£69½	£70
Three months ..	£71½	£71½	£71½	£71½
Week's turnover ..	6,450 tons		7,350 tons	
TIN				
Cash	£784	£785	£787½	£788
Three months ..	£784	£784½	£790	£790½
Settlement	£785		£788	
Week's turnover ..	530 tons		1,295 tons	
ZINC				
Current ½ month ..	£78½	£79	£77½	£77½
Three months ..	£77½	£77½	£76½	£76½
Week's turnover ..	6,825 tons		4,700 tons	

Mining Finance

Making the Best of Hard Times

The annual reports of the Consolidated Zinc Corporation and of New Broken Hill, though sombre in tone, prove that even a recession can be turned to advantage.

When the prices of the two metals began to decline sharply, the managements of the Broken Hill companies were faced not only with surplus plant capacity, but also with surplus manpower—a dangerous situation in a town which, like Broken Hill, is almost exclusively dependent on one industry.

The solution adopted by the Consolidated Zinc directors might serve as an example to less flexible managements everywhere. The first step was to negotiate a short-time agreement with the unions, and this was carried through without difficulty—the fruit of many years of enlightened labour relations. This reduced effective capacity by 10 per cent, but a further cut was necessary if a full contribution was to be made to the problem of lead/zinc oversupply.

In order to achieve a further reduction in output without further cuts in the effective labour force, the management

decided to transfer workers as necessary from production to development. The result was a reduction in ore treated by 27 per cent from the 1957 level.

The benefits of this policy will become apparent when lead/zinc demand is once again running at a satisfactory level. No indication has been given by the company of the extent to which development has been accelerated, but there can be no doubt that the Broken Hill companies will be in an excellent technical position when demand picks up. Meanwhile, the ore remains in the ground to await mining in more propitious times.

Statements by Mr. L. B. Robinson, chairman of the companies, are on page 630.

BECEKA FIGHTS BACK

As the world's largest producer of crushing boart, the Société Minière du Bécéka is in the direct line of fire of competition from the G.E.C. synthetic product. At the same time, the general slackening of activity in America, and

the de-stocking which accompanied it, caused a quite sharp drop in consumer demand for boart.

To judge from its annual report, Minière du Bécéka has taken both these developments in its stride. The Société obviously feels that the best way to compete with synthetics is on price, and even with present mining methods C.S.O. could reduce its boart price without overmuch hardship to Bécéka. The higher degrees of mechanization, which are being introduced with some speed, should make the minimum possible selling price lower still.

It is this policy of rapid mechanization which allows Bécéka to treat the falling-off of sales as almost a welcome lull. The production programme for 1959 was re-scheduled, and three sites which were only partially mechanized were closed down for total mechanization. These will be reopened when demand warrants.

One of Bécéka's major non-diamond interests is the exploitation of a vast new manganese deposit at Kisenge. Details of progress in this project will be found on page 632.

RAND DIVIDEND SEASON OPENS

The first of the June Kaffir dividends will cause little excitement. Most of the mines concerned in the Anglo American mid-year declarations are, to say the least, mature, so that the trend of dividends can be forecast well in advance, while the two younger mines involved are paying the same as a year ago. The last four payments are summarized below.

Mine	Dec. 1957	June 1958	Dec. 1958	June 1959
	s. d.	s. d.	s. d.	s. d.
Brakpan	4½	4½	6	4½
Dagga	2 9	2 6	2 6	2 3
E. Dagga	9	7½	7½	7½
S.A. Land	1 6	1 6	1 6	1 3
Springs	4½	—	4½	—
Vaal Rfs.	2 3	1 6	2 0	1 6
W. Reefs	1 3	1 3	1 3	1 3

Interim dividends have also been declared by three of the Anglo American holding companies—Ofsits, Writs, and Amits. Ofsits, as had been widely anticipated, is raising its interim distribution from 1s. 6d. to 2s. Last year's total was 4s. Writs and Amits, on the other hand, are repeating the previous year's payments of 1s. 3d. and 7s. 6d. respectively.

Another item in this spate of Anglo American dividends is a maintained interim of 1s. from Rand Selection.

NORTHSPAN PROFITS IMPROVING

A statement from the Rio Tinto Mining Company of Canada indicates that monthly operating surpluses at Northspan have increased steadily throughout 1959 in spite of the closure of the Spanish American mine. The recent introduction of strict grade control has resulted in throughput being reduced from 259,000 tons in January, when all three mines were working, to 219,000 tons in April from Lacnor and Panel only, but the amount of uranium produced increased over the same period from 416,000 lb. to 442,000 lb. Operating costs have also been reduced.

Both of the Northspan mines are currently engaged in depth development programmes. At Panel, the deepening

LONDON MARKET HIGHLIGHTS

After the previous week's advance, the South African gold share market began to show signs of tiredness last week. The atmosphere on Monday was subdued largely because the Cape—which had been doing most of the earlier bidding—was on holiday. A fresh rise developed on Tuesday, but petered out on the following day. The excellent profits figures in the May returns seemed to have been discounted by the earlier rise in prices and the first batch of the half-yearly Kaffir dividends proved to be rather uninspiring.

Also disappointing was the absence of an increased interim from "Writs" and these shares eased back 1s. 3d. to 61s. 6d. Rand Selection were 1s. down at 56s. on their merely maintained interim, but any increase in the year's total dividend was in many quarters not expected to be announced before the final payment in November, when the results for the year will be known.

St. Helena, however, held their earlier rise to a 12-year peak of 63s. 7½d. Johannesburg again bought Welkom (24s.) on hopes of something turning up in the potentially rich south-western corner of the property, and was not put off by the likelihood that the mine will need to raise fresh capital some time this year. Meanwhile, Western Holdings advanced further to 166s. 10½d. in front of the sharp jump to a new record in May earnings. "Ofsits" rose to a peak of 105s. 6d., but later shaded to 105s. when the moderately increased interim dividend was announced. Anticipations of the annual report due next week lifted Middle Wits to 24s. 9d. and demand from both Paris and Johannesburg

caused a jump of 2s. 3d. to 49s. 9d. in East Rand Proprietary.

Finance shares held firm for the most part, with stock becoming increasingly in short supply. After having been overlooked in the previous advance, Anglo-Transvaal (46s. 3d.) began to make up lost ground.

Tin shares seemed little affected by either the increased output quotas announced for the September quarter or by the swing to the left in the Singapore elections. Geevor provided a talking point following the bid of 23s. 6d. for the shares. The market price was immediately raised to 26s., but later reacted by 1s. 6d. after some sellers had appeared.

The copper share market behaved uncertainly. Earlier in the week the usual end-account profit-taking had taken its toll of prices. "Rhoanglo" (85s. 7½d.) and Rhokana (27½) both lost ground. But a more hopeful start to the new account was thwarted by the overnight setback on Wall Street and the erratic movements in the metal price. As a result, share prices came back further with "Rhoanglo" falling to 83s. 9d. and Rhokana to 27. Lead-zincs moved erratically, the market deriving little comfort from the New Broken Hill report.

Elsewhere, the news that St. John d'el Rey will be wanting another £500,000 additional financing to cover gold losses and studies for iron-ore developments was not very enthusiastically received, and shares dropped 2s. 6d. to 82s. 6d. Retia Phoenix, on the other hand, jumped further ahead to 8s. 3d. despite the absence of any statement on the company's future.

programme is nearing completion, and the benefits should be felt in August. Lacnor is still shaft sinking, and no advantage will be felt until the end of the year, when it will be able to dispense with the ore at present being won from Algom claims by arrangement with that company.

The statement says that in spite of the current improvement, it will still be necessary to ask bondholders to agree to a re-scheduling of the payments due to them. Deferments of some parts of the remainder of the funded indebtedness have already been arranged. On the basis of present operations, the general mortgage bonds will be completely redeemed by the due date of July, 1963.

SOUND GUIDE TO FOLLOW ?

In all respects but one, West Vlakfontein is a typical example of an unsuccessful mining company making valiant efforts to turn itself into a small finance house. As a rule, it is good investment policy to ignore such companies until they have shown signs of establishing themselves in their new role. West Vlakfontein could be an exception.

The factor which sets West Vlakfontein apart from the mass of similar companies is its chairman, Mr. E. Jacobson. Mr. Jacobson has a nose for gold, proved by his instrumental part in the discovery of the Kinross field. His particular interest at the moment is the Dealesville area of the O.F.S. The pressure of liquidity within the major finance houses has led to intensive prospecting in this area, and West Vlakfontein has acquired an indirect 3.75 per cent interest over some 200,000 morgen of the area at present being drilled. No results are as yet available, but the prospect comes from a stable worth following.

As well as the Dealesville interest, West Vlakfontein has small interests in the J.C.I. western prospect, and in the current drilling to the north-east of Hartebeestfontein and Buffelsfontein, as well as a substantial block of Winkelhaak shares. In addition, the company is constantly investigating other mineral propositions in the Union which may or may not prove worth while. Meanwhile, at the present share price of about 7d., there is little to lose, with the possible chance of a great deal to gain on a long-term view.

Financial News and Results

Anglo Exercises Loraine Option.—In terms of the scheme of arrangement covering the merger between Loraine and Riebeck, Anglo American has exercised its right to convert £864,892 of its interest-free loan into ordinary shares. At a price of 24s. 7d., this will represent an issue of 703,641 shares, raising Loraine's issued capital to 16,066,986 shares of 10s. each.

Anglo-Burma Tin.—Net profit of Anglo-Burma Tin for the ten-month period to April 5 last was £831 after tax of £207. This has been added to the carry-forward, making a total balance of £1,760. Meeting, July 8.

Torbrit's Problem.—Known ore in the claims of Torbrit Silver Mines will be exhausted some time during June or July, according to Mr. J. A. H. Paterson, the

president. Exploratory work on the North Star claim has indicated a possible 41,000 tons, averaging 14 oz. silver per ton, but this tonnage would not justify the large capital which would be involved in its exploration. First priority is, therefore, being given to further exploration to the south-west.

Bremang Back in Full Swing.—The No. 3 Dredge of Bremang Gold Dredging has been successfully re-erected on the Offin River, and has restarted operations.

Mining Corporation of Canada.—During the coming summer, the Mining Corporation of Canada will have five prospecting parties in the field, said Mr. Norman C. Urquhart, president, at the corporation's annual meeting in Toronto. A number of claims have been staked in Ontario and Quebec. Approximately 6,000 ft. of drilling has already been carried out in the Mattagami-Chibougamau area of Northern Ontario.

Gold, Copper, and Super-Phosphates.—Transvaal Gold Mining Estates have decided to open a super-phosphate factory at Graskop. Production is expected to begin in October, 1959. The new

plant will utilize waste sulphur dioxide from the proposed copper-gold extraction plant at Pilgrims Rest, and raw rock phosphate from the Phosphate Development Corporation's deposits at Phalaborwa. A good local market is believed to exist.

Lake George Interim Report.—An interim report from Lake George Mining Corporation for the period July 1, 1958, to April 5, 1958, states that the production target of 18,000 tons per working period has been maintained throughout. The grade of ore milled has been satisfactory, but recoveries of lead, zinc, and copper have fallen slightly due to difficulties in treating ore from the upper levels of the mine.

New Listing for Algom.—The shares of Algom Uranium Mines are now listed on the American Stock Exchange. Trading commenced on April 30.

West Spaarwater.—The balance sheet of West Spaarwater at December 31 shows current assets of £1,018 compared with liabilities of £31,434. Meeting, Johannesburg, June 26.

(Continued on page 630)

WESTERN SELECTION AND DEVELOPMENT

INTERESTS IN GHANA AND CANADA

The 29th annual general meeting of Western Selection and Development Co. Ltd., was held on May 28 in London. Mr. C. J. Burns, Chairman, presiding.

The following is an extract from his Statement circulated with the Report and Accounts for the year ended September 30, 1958:

The profit, £95,128, compared with £60,171 in the previous year, reflects the improvement in the operating results of our investments in Ghana and the recovery in stock market conditions generally. The Directors recommend a dividend of 8%, less tax.

The Chairman, addressing the meeting, said *inter alia*: I have just returned from a visit to Ghana and Canada, in which countries we have over 88% of our assets.

Ghana Investments

Recently I have drawn attention to what I consider to be the opportunities for profitable investment in Ghana. In spite of certain press reports which in the last few days have suggested that the risks inherent in investment in Ghana were great, I have not changed my opinion. The most important factor is what actions the Ghana Government take in respect of the mining industry. The Government's actions speak for themselves. They are not the actions of irresponsible Government, nor do they represent the initial stages of nationalization.

Our own interests in Ghana show a marked improvement. Ghana Main Reef was enabled to increase its dividend and operations to date have maintained their more profitable trend. Ariston Gold Mines had a very satisfactory year and the new issue should provide the finance required for the exploitation of the deep levels. Bremang Gold Dredging Company have not published their annual accounts, but the quarterly statements have shown that their profits should be more than doubled. Amalgamated Ban-

ket Areas results also show a marked improvement over 1957 and the debit balance on Profit and Loss Account has been eliminated.

Canadian Interests

During my short visit to Canada, I had the opportunity of discussing our present and future programmes with our consulting geologists, and of appraising the results of our work on our two main properties.

GENRICO MINES: Due to the unusually mild weather, the break-up at Tow Lake started much earlier than usual this year, and so drilling has had to be suspended temporarily in this area. However, the Company had already acquired an option on the Smith Tiblemont Gold property in North-western Quebec. To date, just over 4,000 feet of drilling has been carried out on the property in 13 completed holes. The drilling results have been highly encouraging.

CORDOBA MINES: The Cordoba Company obtained the services of Mr. R. A. Shatford, the consulting geologist responsible for bringing in the most successful and profitable gold mine in the Red Lake area, namely: Campbell Red Lake Gold Mine. Mr. Shatford stated that the geological controls already established showed that the andesite rocks, that had so successfully proved host to orebodies at the adjacent Campbell Red Lake and New Dickenson Gold Mines, occurred predominantly on the extensive Cordoba property.

To date, his drilling results have confirmed his interpretation. His opinion is that such information, if continued, will provide evidence to warrant twenty to forty thousand feet of further drilling, only a small part of which should be necessary to locate major ore occurrences. All this is most encouraging and justifies the programmes planned and carried out by our Canadian subsidiary.

The report and accounts were adopted.

NEW BROKEN HILL CONSOLIDATED

REDUCED OUTPUT AND LOW METAL PRICES

The 23rd Annual General Meeting of New Broken Hill Consolidated, Limited, will be held on June 23 at 37 Dover Street, London, W.1.

The following is an extract from the Statement by **Mr. L. B. Robinson**, which has been circulated with the report and accounts:

The low level of lead and zinc prices prevailing at the end of 1957 continued during the first three quarters of 1958 and showed only a slight improvement in the last quarter. The average London Metal Exchange prices for prompt delivery of these metals during 1958 were £72 16s. for lead and £65 18s. 1d. for zinc, compared with £96 13s. 4d. and £81 12s. 4d. respectively during 1957. At the 1958 price levels there can normally be little profit from mining these metals, but due partly to the average assay of the ore produced during the year being higher than that of recent years, partly to a reduction of operating costs, and partly to some satisfactory forward contracts, a trading balance of £1,037,063 was achieved, compared with £1,904,035 for 1957. The profit before taxation amounted to £696,303, compared with £1,591,313 for 1957. The provision for Australian and United Kingdom taxation on the profits for the year amounts to £219,986 compared with £534,217 for 1957.

The result is a net profit for the year of £476,317, compared with £1,057,096 for 1957.

The directors are recommending a final dividend of 10d. per share, free of tax, compared with the equivalent of 1s. 8.7d. per share, free of tax, last year. This gives a total distribution for the year of 1s. 4d. per share, free of tax, compared with the equivalent of 2s. 10½d., free of tax, for 1957.

There was a reduction of approximately 27 per cent in the tonnage of ore treated in 1958 and production of recoverable lead during the year was 12 per cent below the 1957 tonnage. Zinc concentrate output was lower by 23 per cent. Despite the substantial reduction in ore treated, the average cost per ton of ore was only slightly higher in 1958 compared with the previous year.

The operating efficiency, measured by the output in tons per mining-department-employee-shift at 4.64 in 1958, is below the record level of 5.58 achieved in 1957. A lower tonnage from the sub-level stope and the reduced proportion of men on stoping operations caused this reduction. On the other hand, the output per contract-stopping-miner-shift (excluding the sub-level stope) showed further improvement at 19.58 tons as compared with 18.18 tons in 1957 and 16.54 tons in 1956.

The recoveries of lead and silver in lead concentrate and zinc in zinc concentrate showed a further satisfactory overall improvement.

The ore reserves fully outlined and developed ready for stoping or in the process of being stoped as at December 31, 1958, were calculated at: 3,600,000 tons assaying 10.5 per cent lead, 2.5 ounces silver, 12.9 per cent zinc, compared with 3,300,000 tons assaying 10.7 per cent lead, 2.7 ounces silver, 12.5 per cent zinc, at December 31, 1957.

THE CONSOLIDATED ZINC CORPORATION

NET INCOME WELL MAINTAINED

The tenth Annual General Meeting of The Consolidated Zinc Corporation Limited will be held on June 23 at 37 Dover Street, London, W.1.

The following is an extract from the Statement by **Mr. L. B. Robinson**, the chairman, which has been circulated with the report and accounts for the year ended December 31, 1958:

The low lead and zinc prices prevailing at the end of 1957 continued during the first three quarters of 1958 and showed only a slight improvement in the last quarter. At the 1958 price levels there can be little profit from mining these metals.

The Group profit, before mining royalty and taxation, fell by £1,594,251, which was fully accounted for by the fall in the profit of the Zinc Corporation's mine at Broken Hill, New South Wales.

Consolidated Zinc Proprietary Limited again had a satisfactory year and showed an increase in profit, which was largely brought about by the sale of rutile and zircon by Titanium and Zirconium Industries Pty. Ltd. at prices arranged under contracts entered into during previous years.

In the United Kingdom, although the profits from zinc smelting and sulphuric acid production by Imperial Smelting Corporation Limited were lower, the profits from the other products, in particular zinc oxide and other pigments and zinc alloys were reasonably well maintained.

Income from trade investments at £996,293 again showed an improvement, largely as a result of a maintained dividend on an increased shareholding in British Titan Products Company Limited.

Mining royalty payable to the New South Wales Government on the profits of the Zinc Corporation's mine amounted

to £12,109, compared with £304,186 for 1957, and reflects the lower level of prices obtained for the mine's products and the fact that royalty is charged on profits on a sliding scale.

The consolidated net profit for the year at £1,617,876, was, as a result of the considerably reduced charge for mining royalty and taxation, only £152,110 lower than the net profit for 1957.

Transfers of £900,000 have been made to general reserves, compared with £750,000 for 1957.

The directors recommend a final dividend of 2s. per share, compared with 2s. 6d. per share last year, giving a total distribution for the year of 3s. per share, compared with 3s. 9d. per share for 1957.

Expenditure during the year on mining property, under development outside the Broken Hill field, amounted to £49,004. In 1957, this heading included expenditure by Commonwealth Aluminium Corporation Pty. Limited, but during 1958, 50 per cent of the Group's shareholding in Commonwealth Aluminium was transferred to the British Aluminium Company Limited.

Capital expenditure commitments at the end of the year amounted to £4,434,000. These include the erection of a zinc smelting plant using the Imperial Smelting process at Swansea, a ferrous sulphate treatment plant, also at Swansea, and an extension of the acid producing capacity at Cockle Creek, New South Wales.

The consolidated balance sheet shows a cash position of £6,002,869, comprising Treasury Bills, Government and other short-term securities, and bank balances.

Since the end of 1958 the Group's resources have been augmented by the "rights" issue of 1,455,100 ordinary shares at 48s. per share.

MINING FINANCE—Continued

Coniagas Mines.—Profits of Coniagas Mines for the year to March 31 amounted to \$38,592. In addition, investment realization brought in a further \$66,113. At the year-end the debit balance on profit and loss account had been reduced to \$883,758, while the value of the portfolio was \$1,650,399. The Bachelor Lake property has remained closed since May, 1958, but negotiations for an outlet for the property's production are stated to have reached an advanced stage.

More From H.E. Prop.—With a proposed final dividend of 7½d. per share, H.E. Proprietary is distributing a total of 1s. 1½d. per share for 1958, against 9d. last year. Group net profit attributable to the parent company was sharply higher at £149,213, compared with £105,249. In his review the chairman, Mr. R. Ellerton Binns, says that profits for the year to date strengthen the previously announced expectation that it will be possible to maintain the current rate of dividend on the capital as increased by the coming rights issue. Meeting, June 10.

Tin Restriction and Selayang.—Although the dredge of Selayang Tin Dredging was only able to work 65 per cent of the possible time in the year to September 30 last, profits held up un-

usually well. Net profit before tax of £6,056 came out at £15,573, against £18,457 (before tax of £6,276) in the preceding year. The proposed dividend is 15 per cent, against 25 per cent in the 1957 financial year. The chairman, Mr. T. J. Bond, points out that the current year's operations will bear the full impact of output limitation. Meeting, June 15.

DAVIES INVESTMENTS LTD. Bankers, still offer 7½ per cent on sums £20 to £500 (withdrawal on demand) with extra ½ per cent on each £500 unit. Details from Investment Dept. MN, Davies Investments Ltd., Danes Inn House, 265 Strand, London, W.C.2.

"PROTO" No. 2 Mark IV, 2-hour self-contained breathing apparatus sets, unused, brand new condition, complete with instruction booklet, packed in strong pressed steel carrying cases; recent Ministry release, offered at special bargain price of £25 10s. each. Woodfield and Turner Ltd., Cannon Street, Burnley. Telephone 78134.

THE F.M.S. CHAMBER OF MINES

FIRST FULL YEAR OF RESTRICTION

The Forty-eighth Annual General Meeting of the F.M.S. Chamber of Mines was held in Ipoh on May 28. The following is the speech by the Vice-President, the Hon. Mr. P. A. Delme-Radcliffe.

Our President is unfortunately unavoidably absent from the Federation and is therefore unable to address you today. I am therefore acting for him and I would ask you for your forbearance.

In attempting a review of the year just past, we are, in fact, concerned almost entirely with the effects of Tin Control. This is the first full year of restriction, and production from tin mines in the Federation has, therefore, been limited by the permissible export tonnage allowed by the International Tin Council and to such stock, in addition, which each mine is permitted to build up.

The number of mines working at the beginning of 1958 included 76 dredges and 573 gravel pump mines. By the end of the year no less than 42 dredges and 240 gravel pump mines had ceased production.

The average Singapore tin price in 1958 was \$369.35 per picul as against \$387.03 in 1956 and \$373.19 in 1957.

The year opened with the price at \$360.00, equivalent approximately to the floor price on the London Metal Exchange of £730 a ton, which the Buffer Stock Manager was bound to defend by purchases of tin. The price remained on or about the floor until September 18, when the Buffer Stock Manager withdrew from the market. The Singapore price fell sharply on the following day to \$344.50, but rapidly recovered and reached the floor price again unaided by buffer stock transactions at the beginning of October. By the middle of the month the price had risen above the floor price, and it has remained above ever since, finishing the year at \$383.50.

Although the restriction of production has been the dominant factor affecting the industry during the year, the export by Russia, generally considered a consumer country, of approximately 18,000 tons of tin, for which no allowance had been made in calculating probable world supply and demand, certainly had a heavy and significant effect on the conditions under which the industry existed. There is no doubt that our difficulties were sharply increased by it, and indeed the difficulties of all producer countries and the people who live in them.

Turning to the International Tin Agreement, we will shortly have to consider the results achieved by the Restriction Scheme against the hopes and intentions that inspired it.

It is as well to remember that restriction of production was introduced at very short notice in December, 1957, under the unforeseen situation arising from mounting Russian exports, and that it continued to operate under a surplus arising principally from this source until September. After that date Russian exports decreased sharply, and the International Tin Council had only the more normal market factors to take into consideration.

Fortunately, business activity began to pick up towards the end of the year, and with confidence somewhat restored the International Tin Council permitted a slight increase in the export tonnage

allowed for the sixth quota period in which we now are.

The market has accepted the prospect of this extra 3,000 tons of metal without disturbance, and indeed the price has remained remarkably steady for some time.

All the tin purchased by the special fund has been sold. The Buffer Stock Manager continues to dispose of tin from the buffer stock. The tin metal held in London Metal Exchange warehouses has decreased from over 19,000 tons last June to only 8,733 tons at the end of April this year. If no unforeseen dumping or other artificial factor affects the market, we are justified, I think, in taking a cautiously optimistic view of the situation.

However, the International Tin Agreement expires in July, 1961. Not later than July, 1960, the International Tin Council must recommend—if it is so decided—to contracting governments, whether it is necessary, or appropriate, to renew the agreement, and in what form. Until a decision is made, the Council must necessarily have in mind the Agreement's end in July, 1961. Accordingly, from July, 1959, in allocating the permissible export amount for each quota period, the Council is bound, under Article XI, to pay regard to the need for disposal of all the tin remaining in the buffer stock by the date the Agreement expires.

Meanwhile, it has clearly been necessary to consider what modifications, if any, to the agreement might usefully be made. A Sub-Committee of the Tin Advisory Committee has been considering this matter and has made its report to the Government of the Federation.

At the appropriate time, the views of our members will be sought, by means of a referendum, upon the question of whether it is thought desirable that the Federation of Malaya should continue to be a signatory to the International Tin Agreement.

The Government of the Federation has in the past sought the advice of the F.M.S. Chamber of Mines and the All-Malaya Chinese Mining Association upon matters of importance to the industry, and it is necessary that we should be in a position to give the advice of the industry as a whole when it is sought.

It would be entirely inappropriate for me to comment at present, or to anticipate the views that may be expressed when the time comes. It would be equally wrong, however, to leave any doubt in anyone's mind upon one matter. The agreement can only survive if the countries who are now signatories to the International Tin Agreement stand together. This is particularly true with regard to the producers. If any one country decided to withdraw, it would have to reach that decision bearing in mind that it would then be unlikely that any others would continue to carry the burden. In fact, the withdrawal of one participating producer country would probably mean withdrawal by them all.

If I may now return to matters closer home, I would say that the year has been one in which, though there has been little apparent change in the conditions under which we mine, significant steps have been taken which may lead to considerable changes in those conditions in the future. I refer particularly to the estab-

lishment of a National Land Council, as provided for in the Constitution. The deliberations of that Council continue, and will we hope shortly be concluded. From them it is not unreasonable to hope that a more enlightened appreciation of the mining industry's position, and its value to the country, will receive recognition.

I am inclined the more to this optimistic outlook since reading the views expressed in speeches by many honourable members of the Legislative Council during the Budget meeting in December last year. It seems that not only is a more appreciative view being taken of the industry's economic place in the country, but—at long last—it is beginning to be recognized that mining does not necessarily ruin even that very small area of the surface of Malaya to which its activities are confined; that some of the land being mined was never more than uninhabited swamp in the first place; and indeed, that mined land can and does carry abundant food crops and fruit trees, and even rubber; that many new villages and housing estates are established already upon the well-drained land consequent upon mining. Where are the biggest herds of cattle grazed? And, is it not true, that a greater weight of food in the form of fish can be produced from an acre of pond than from an acre of the best agricultural land? This dawning recognition in the minds of the country's elected representatives—that miners are not quite such a menace as they have been made out to be in the past—is most welcome.

It is not long now to the time when the excitements and distractions of the elections will be behind us. It is then that we shall look hopefully to an early consideration of these urgent problems of land alienation and of excessively burdensome taxation to which in these addresses—if you will look back through them—our past Presidents have, year after year, drawn attention. As to the elections themselves, I think it is only necessary to say—what must be obvious—that the industry, and every man that earns his livelihood from it, hopes only for a fair and stable government under which, as in the past, all may earn their living in peace.

It has been customary here to draw attention to the diminishing tin ore reserves, and to the plant already lying idle. It would be wrong to expect me to omit doing so again. In fact, it is more important than ever to do so, since it might be thought that under the acute restriction of production that exists at present, the matter is no longer urgent. There could hardly be a greater blunder than to think so. Even under restriction, the unceasing and relentless diminution of reserves continues. If Malaya is to remain first among the nations as a producer of tin, it is vital that not only the problems of land alienation and taxation should be considered, but that Government should consider in what manner active encouragement can be given to mining throughout the country. It would certainly be an encouragement to know that thought was being given—as indeed it may be now—to the problem of resolving conflicting interests in the land surface, so that, in a manner completely satisfying to all, no barrier would remain to the development of any mineral that might lie below.

In matters that have been adversely affecting prospecting there is one in which remarkable progress has been made. I refer to the emergency. The Government of the Federation, and the Security Forces, are to be congratulated on the very rapid progress made during the year. Almost all the Federation is now "white", certainly all the more important tin-mining areas are classified as white, and the inhabitants and industries within them are now largely freed of the many restrictions that were previously necessary. It is once again possible to send prospecting parties into the field nearly everywhere without escort and without the imposition of strict and difficult food control. It is fervently to be hoped that success will continue to attend the Security Forces, and that the last terrorist will be eliminated before long. Communism has a certain persistence, and the approaching successful end of the battle fought with armed communism provides no occasion for overlooking the parallel dangers of hidden penetration and subversion of all those public activities through which in all countries communists seek to make their way to power. The recently published White Paper on communist tactics is reassuring to the extent that it shows how well aware of this danger is the Government of the Federation.

Before leaving the matter of prospecting, we must also welcome the enterprising outlook that made possible the recent airborne magnetometer survey. The reports are now coming out, and though it is too early to say whether new mining ventures will eventuate from them, we particularly welcome the comparatively rapid publication of the results. We know that much valuable field work is being carried out all the time by the staff of the Geological Survey Department. But I would put in a strong plea that rapid publication of the results, as in the case of the airborne survey, should take place. It would be most welcome if the reports on all field work that has taken place during the last ten years that have not yet been published could be brought out this year. These reports are of considerable assistance to the industry.

I would like also to refer to the valuable help and co-operation we continue to receive from officers of the Mines Department. A great deal of extra work has been thrown on them in the day-to-day administration of Tin Control. The work has been particularly tiresome and difficult, and our thanks are certainly due to them—and to all who have served on regional committees and on the Central Committee. For their extremely wearisome and difficult task they have received more kicks than kisses, and it is right that they should receive due tribute on this occasion. The Mines Department Research Laboratories also have been most valuable to the industry, particularly in dealing with ore-dressing problems. The officers there are ever ready to help and are a source of many stimulating ideas. Their experiments have certainly been of importance to gravel pump and dredging mines alike.

Finally, I am sure our President would wish me on his behalf to thank all members of the Council, and particularly those who have served on the innumerable sub-committees that involve, as you know, a great deal of extra time and work. Our thanks are due also to Sir Vincent del Tufo, whose high qualifications have been so ably used as this country's delegate at meetings of the

International Tin Council. May I also thank on your behalf our Secretary, Mr. Pearson, and all our staff here. In conclusion, I would express the hope—and

the confidence—that having passed through a most difficult year, the industry has before it a year of lightening restriction and expanding opportunity.

SOCIÉTÉ MINIÈRE DU BÉCÉKA

(Incorporated in the Belgian Congo)

The Thirty-Ninth Annual General Meeting of the Société Minière du Bécéka was held on May 27, 1959. The following are translated extracts from the Directors' Report which has been circulated to shareholders:

World production of rough diamonds, gem and industrial together, has been estimated at 26,045,080 carats for 1957, compared with 23,718,331 carats in 1956.

Estimated world production for 1958 is in the region of 28,000,000 carats.

The Central Selling Organization reported a sales figure of £65,543,387 for 1958, compared with the record figure of £76,772,112 for 1957. The figure for the sale of gem diamonds for 1958 amounted to £49,420,696, in comparison with £52,818,096 in 1957; industrial stones totalled £6,594,889 for 1958, compared with £12,626,101; and crushing board £9,527,802 for 1958, against £11,327,915.

The sales of gem stones, which were low at the beginning of the year, picked up fairly quickly, and figures for the third quarter constituted a record. Sales of industrial stones were disappointing, but a marked increase was noted in the last four months of the year.

With regard to the position of crushing board, the effects of the recession in the United States brought into play the existence of considerable stocks which had been accumulated by consumers during the period of shortage. The knowledge that all possible needs could be met by the Minière du Bécéka's increased output had the result of enabling the diamond tool manufacturers to suspend or slow down their purchases and use up their existing stocks.

The gap now existing between the total of sales and output allows the company to operate within a margin, which they had not been able to do in the past. The Société Minière du Bécéka, and its associated and affiliated companies, are continuing their research into improving the quality of output and sales organization.

Diamond Production

Lubilash Section

The firm prices which have been maintained for our products for the last few years allowed us to follow a policy of increased production in 1958. Output reached a total of 16,004,150 carats, almost a million carats above the total for 1957. This was made possible by modern mechanical methods, which allow larger quantities to be extracted and treated. Waste, barren rock and

gravel was mined by shovels, electric excavators and rotary shovels, and transported by conveyor belts or tubs.

We referred above to the slowing down of activity in the United States and Europe during 1958, when the demand for crushing board suffered a sharp drop. This coincided with the advent of synthetic products which further depressed the market. This position made it necessary for us to review our production programme for 1959, taking into account the market situation.

We therefore decided to stop operations on three sites which were being partially mined by mechanical methods. Study is being undertaken with a view to their being completely mechanically mined when the market position allows them to be reopened and worked economically.

A total of 5,642,000 cubic metres was excavated, compared with 5,358,000 cubic metres in 1957, and the proportion worked by mechanized mining was again increased, 98.4 per cent being mined mechanically, compared with 97.7 per cent in 1957.

During the first quarter of 1957 the first section of the treatment plant for cleaning and concentration of diamondiferous gravel started work. This achievement marks the completion of the mechanization programme here. The plant will treat all the virgin gravel transported to it by conveyor belts three kilometres long. Research is being undertaken into the question of installing a new sorting plant, where all treatment and separation would be mechanized.

Luebo Section

Five mines are being worked. Output reached 85,884 carats compared with 67,657 in 1957.

Associated Company

Société Bécéka-Manganèse

The erection of the first stage of the plant continues according to plan. The plant for treating low-grade ores started regular working towards the end of 1958, with satisfactory results.

Production of marketable ore was raised to 320,000 tonnes in 1958, and a considerable part of the 1959 output has already found markets.

The accounts at the end of 1957 showed a profit of Frs.C.31,858,204, after placing Frs.C.25,000,000 to reserve. This allowed a net dividend payment of Frs.C.110 on each of the 200,000 shares.

Publications Received

Preliminary geological maps of the townships of Carscallen, Jamieson, Mountjoy, Ogden, Turnbull, and Robb, have been prepared by the Ontario (Canada) Department of Mines from previously published geological and aeromagnetic maps, assessment work reports, and surface maps of individual properties. The base maps for plotting are taken from the Forest Resources Inven-

tory sheets, Ontario Department of Lands and Forests, and are on a scale of 1,320 ft. to the inch. The geology was compiled by S. A. Ferguson.

Uncoloured white prints of each township may be obtained on order from the Ontario Department of Mines, Parliament Buildings, Toronto 2, Canada, at a cost of 50 c. each, or \$3 for the set of six townships.

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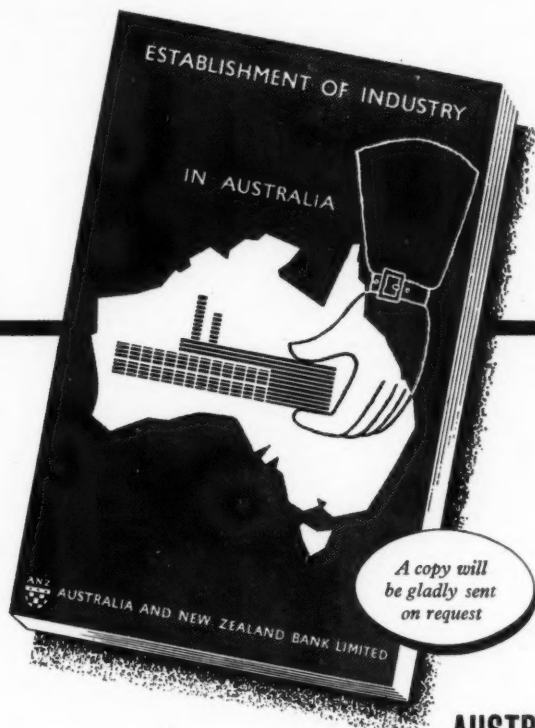
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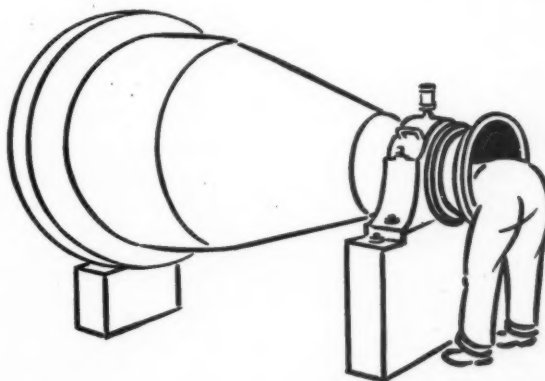
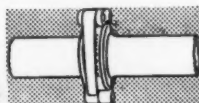
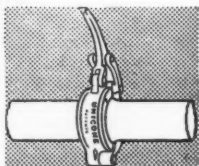
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UNION MINIERE DU HAUT-KATANGA

The Annual General Meeting of Shareholders was held in Brussels on May 28, 1959, **Mr. Paul Gillet**, Chairman of the Board of Directors, being in the chair.

The Meeting approved the accounts for the financial year ending December 31, 1958. The Profit and Loss Account showed a gross profit of 3,799,799,056 francs. After deduction of amortization for the year, provision for taxation on profits, interest and sundry taxes and royalties, the available profit balance totalled 2,410,626,892 francs.

The Meeting fixed the net dividend for the year 1958 at 1,500 francs per share (or 150 francs per tenth part of a share). Taking into account the interim dividend of 600 francs paid in January, 1959 (60 francs per tenth part of a share), the balance of 900 francs net per share, or 90 francs net per tenth part of a share, becomes immediately payable.

Messrs. E. Sengier and A. Marthoz, Directors whose mandates expired, were re-elected. Mr. P. Jadot was re-elected as auditor of the Company.

Mr. Sengier's Statement

The 1958 copper production—235,586 metric tons—has been slightly lower than that of 1957. Deliveries, however, were greater than production and have necessitated a withdrawal from the stocks.

Mr. Sengier points out that whilst the amount of the dividends paid to the shareholders other than the Government of the Congo represents 1,547 million francs, the State has drawn directly 2,196 million francs from the Company's activity during the financial year.

The years 1956, 1957, 1958 have been a very unusual period as far as the copper market is concerned: the lowest

level, i.e. 20 cents per lb., was reached in February, 1958. The quotations have since normalized, and the equilibrium between production and consumption has improved. During this period Union Minière characterized itself by the stability of its prices and the regularity of its deliveries.

The outlook for the near future is good, declares Mr. Sengier, thanks to the increase in demand for various goods containing copper, and to the rebuilding of the stocks in the consumption industries of the United States.

Long-range optimism also prevails; the growth of the population and the rise in the standard of living will entail a more and more extensive recourse to electricity which, in its numerous applications, accounts for 60 per cent of the red metal's consumption.

A profit nearly equal to that of 1957 has been realized, although the average price has been lower: this is due to a reduction in costs and to the formulas according to which an increase or reduction of profits resulting from a rise or fall in the price of copper is shared by certain organizations co-operating with the Company's activity.

Thus the results of Union Minière compare advantageously with those of other Companies carrying on the same activity.

If the copper quotations were maintained at the present level, the profit balance of the financial year 1959 would be favourably influenced, all the more so because the copper production programme for this year is 260,000 tons.

In conclusion, Mr. Sengier paid tribute to his European and Congolese collaborators, and expressed his confidence in the Company's future.

Main points from the Board of Directors' Report

Mining activity has still been concentrated on Prince Leopold Mine and on the mines of the Western region. Total extraction reached about 7 million metric tons of ore. Copper production was initially fixed at 90 per cent of that for 1956, which corresponded to a rate of about 222,000 tons for the year. The market's recovery allowed an adjustment of the programme during the second half of the year, so that the 1958 production, i.e. 235,580 metric tons, was inferior to that of 1957 by 4,700 tons only.

Cobalt production was limited to 6,500 tons; the price remained at \$2 per lb. during the whole year 1958.

Zinc concentrates production amounted to 200,000 tons at 57 per cent zinc. The zinc market remained weak and the quotations reached their lowest level since 1946, to recover slightly at the end of the year.

The Shinkolobwe concentration plant produced 3,100 tons of uranium concentrates assaying 68.5 per cent U_3O_8 . The agreements concluded between Belgium, the United States, and the United Kingdom for uranium deliveries are progressively nearing expiration. Union Minière is, from now on, in a position to offer to private industry the products of nuclear quality manufactured by the Société Générale Métallurgique de Hoboken (Belgium). Furthermore, Union

Minière delivered 69.7 grammes of radium.

Germanium production amounted to 23,400 kg. of recoverable oxide, which necessitated the enlarging of the plants treating the germanium-bearing products. Moreover, the Company also produced 140 tons of cadmium, 118 tons of silver, and 56 kg. of gold.

Among the works under construction, the progress achieved at the Luilu copper-cobalt electrolysis plants should be pointed out; production will start during the second half of 1960.

Electric power supplied by Union Minière to consumers reached 1,938 million kWh., of which 705 million were delivered to Northern Rhodesia.

The reduction of the Congolese labour force from 21,700 to 19,650 units has been carried out without let-up, but only through normal departures and limitation of recruitment.

The Company has given constant attention to increasing the professional skills of its workers, as shown by a series of new measures adopted in connection with the formation and promotion of its personnel. School attendances continued to increase: some 20,000 pupils attend the Company's schools.

The social atmosphere in the Katanga remained good.

AMALGAMATED BANKET AREAS

The Twenty-third Annual General Meeting of Amalgamated Banket Areas, Ltd., was held on May 29 in London.

Mr. C. J. Burns (Chairman) presided. The following is an extract from his Statement circulated with the Report and Accounts for the year ended September 30, 1958:

The improved conditions mentioned in the Review last year have been maintained so that the profit of £162,640 for the year has completely eliminated the debit balance on Profit and Loss Account.

During the year under review production increased by 42,229 tons to 739,760 tons, and the grade improved by 0.623 dwt. to 4.872 dwt. per ton. Development footage was practically the same as in the previous year, amounting to 25,354 feet at a total cost of £198,806. Ore reserves show a decrease of 124,519 tons, but the average grade of the reserves increased slightly from 5.487 dwt. to 5.592 dwt.

Chairman's Additional Remarks

The Chairman said:

In my Review I laid great stress on the importance of increased development, and I would now like to touch briefly on the development results for the current financial year to the end of April:

ABBONTIAKON: The 17 W/L Drive, after negotiating a large traverse fault, is being pushed ahead as rapidly as possible and so far shows payable values of 4.7 dwt. over 36 inches for 150 feet. The extent of the pay shoot is unknown, but there is every possibility that it extends right across the syncline and it is hoped to push 20 W/L Drive North to prove the downward extension of this shoot as soon as possible.

A diamond drill hole off 2117 Cross-cut towards the downward extension of the old orebody has revealed an underlap reef between the "C" reef and the old orebody. This shows values of 6.5 dwt. over 36 inches in the West Reef and 10.2 dwt. over 36 inches in the Main Reef. Cross-cutting to this reef has started, and the prospects for exploring A.V.S. in depth are very encouraging.

Diamond drilling has disclosed a possible west reef between 17 and 20 West limb levels and cross-cutting from 19 level to prove the extent of this pay shoot is proceeding. There is every indication that this could bring in a large tonnage of pay ore.

TAKUHA MANTRAM: The "K" loco haulage is proceeding satisfactorily and 850 feet has been advanced to date. If this rate is maintained, the haulage should be completed by the end of October.

EFFUENTA: Results being obtained here fully justify the cost of the "K" loco haulage, and it is hoped that at least 100,000 tons of 4.5 dwt. ore will be available as soon as a holing is made. It is intended to continue the haulage way southwards below the Tamsoo area, and it will ultimately cause the cessation of ore hoisting and ropeway transport from the Effuenta and Tamsoo sections. Substantial savings in working costs will accrue.

All the emphasis at Amalgamated Banket Areas is on development, and we are firmly convinced that with government assistance we could increase footage considerably and reduce the overall cost per foot of development.

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